SAGUARO LAND BULLETIN

DESERT BOTANICAL GARDEN of ARIZONA

JANUARY, 1959

Succulent centerpiece winner, composed of a crested Crassula, Sempervium and Lithops. Entered by John B. Hales, 1958 Show.

REG MANNING

SAGUAROLAND BULLETIN

Published and owned by the Arizona Cactus and Native Flora Society, sponsors of the Desert Botanical Garden of Arizona, P.O. Box 547, Tempe. Saguaroland Bulletin attempts to promote the Garden and to provide information on the desert plants and their culture. Subscription $3.00 per year, the subscription including active membership in the Society and the Desert Botanical Garden. Issued 10 times a year.

W. HUBERT EARLE, Editor

Volume 13 JANUARY, 1959 No. 1

Arizona Cactus and Native Flora Society

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Desert Botanical Garden of Arizona

STAFF

Director ..... W. Hubert Earle
Consulting Botanist ..... James A. McCleary, Ph. D.
Horticulturist ..... John H. Weber
Assistant Horticulturist ..... V. Edgar Jones
Student Horticulturist ..... Demetrios Vlachos

Garden open daily, including holidays, 9 A. M. to 5 P. M. from October 1st to June 1st.

GARDEN MEMBERSHIPS

The various classifications of Memberships in the Garden are Founder, Life, Annual;- Benefactor, Sustaining, Sponsor, Builder and Active.

Over a year ago, an appeal was made thru the Bulletin requesting members holding the Active ($3.00) membership to raise their membership to the Builder ($5.00) classification. The response was very good with the result that we now have very few Active memberships. The increase helped to defray the increased publishing costs of the Bulletin plus the raise in postal rates.

In the past we have had many inquiries by students of Colleges and High Schools asking for memberships in the Garden but when they learned of the cost (Active of $3.00 being the lowest) they hesitated in taking out a membership. We have now replaced the Active membership with a Student membership at $2.00 per year and already several High School students have taken out memberships.

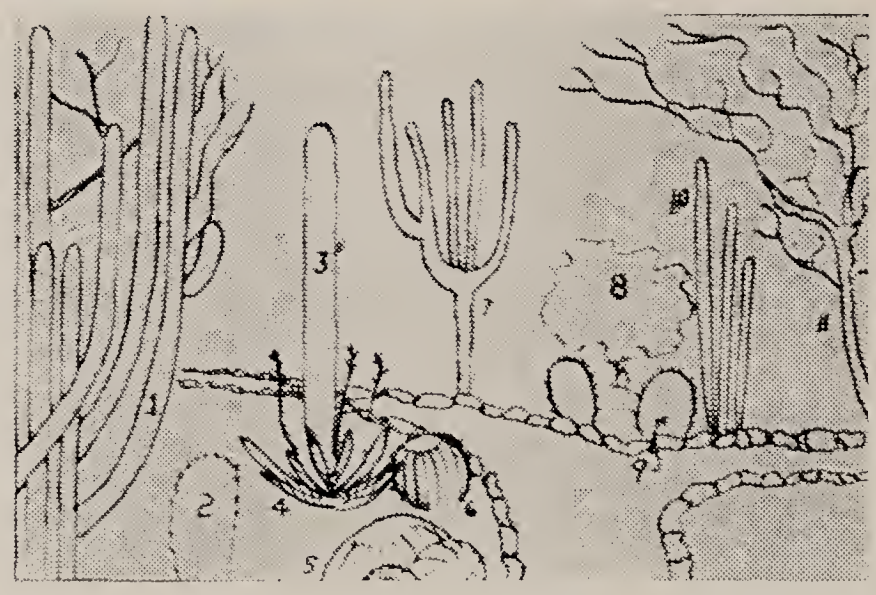
Members of the Garden who now hold Active memberships may continue with them indefinitely but an increase to a higher classification would be appreciated.

The Garden is now over 20 years old and its memberships have grown from nil to over 500. We hope to add many more memberships each year and in another ten years have over a thousand members. Your continued support is certainly appreciated. Do not forget that your memberships are tax deductible.

CALENDAR OF EVENTS FOR JANUARY AT THE GARDEN

1st	3 P.M.	Lecture — Arizona Scenics
6th	8 P.M.	Cactomaniac Meeting — Showing of Kodacromes by C. J. Fuhrer, Alliance, Nebr.
7th	3 P.M.	Winter Class begins in "Appreciation and Identification of Desert Plants"
8th	3 P.M.	Lecture — Arizona Trees & Shrubs
14th	3 P.M.	Class — Desert Plants
15th	3 P.M.	Lecture — Arizona Birds & Reptiles
21st	3 P.M.	Class — Succulent Plants
22nd	3 P.M.	Lecture — Succulents Other Than Cactus
28th	3 P.M.	Class — Xerophytes & Mesophytes
29th	3 P.M.	Lecture — Arizona Cactus

BEGINNING OF THE DESERT BOTANICAL NATURE WALK



1. Mexican organ pipe (Lemaireocereus stellatus). 2. Red Barrel (Ferocactus coloratus). 3. Old Man of Mexico (Cephalocereus senilis). 4. Red Aloe (Aloe striata). 5. Golden Barrel (Echinocactus grusonii). 6. Yellow needled barrel (Ferocactus flavescens). 7. Mountain pitaya (Lemaireocerus montanus). 8. Feathery Cassis (Cassia artesimoides). 9. Melon Barrel (Ferocactus alamosensis var.). 10. Smooth organ pipe (Lemaireocereus marginatus). 11. Honey Mesquite (Prosopis juliflora).

A different photo will be used for each of the ten issues this year showing various parts of the Garden. These cards can be obtained from the Garden Book Store at 10 for 50c.

Twelfth Annual

CACTUS SHOW

FEBRUARY 23RD TO MARCH 1ST, 1959

Sponsored by the Phoenix Gazette and the
Desert Botanical Garden

Administration Building

Desert Botanical Garden

A centerpiece of Cactus and Succulents.
A winner entered in the 1958 Show
by Mrs. Charles Gilliland.

SCHEDULE OF CLASSIFICATIONS

SECTION "1" **CACTI**

A. **POTTED SPECIMEN PLANTS**

1. MAMMILLARIA
2. CORYPHANTHA
3. OPUNTIA
4. THELOCACTUS
5. ECHINOMASTUS
6. ECHINOFOSSULOCACTUS (Stenocactus)
7. LOBIVIA
8. ECHINOPSIS
9. ASTROPHYTUM
10. CEREUS
11. ARIOCARPUS
12. ECHINOCEREUS
13. GYMNOCALYCIUM
14. BARRELS - Ferocactus and Echinocactus
15. EPIPHYLLUM
16. ANY OTHER SPECIES

B. **CRESTED SPECIMENS**

1. Crested Cactus - own root
4. Crested Cactus - grafted

SECTION "2" **SUCCULENTS:**

A. **POTTED SPECIMEN PLANTS**

1. EUPHORBIA
2. DUDLEYA
3. KALANCHOE
4. ALOE
5. SEDUM
6. ECHEVERIA
7. HAWORTHIA

8. AGAVE
9. YUCCA
10. STAPELIA
11. CRASSULA
12. LITHOPS
13. MESEMBRYANTHEMUM
14. PLEIOSPILOS
15. ANY OTHER SPECIES

SECTION "3" **ARRANGEMENTS** (Accessories Permitted)

A. **DISH GARDENS:** (Any Size Garden)
   1. Cacti
   2. Succulents
   3. Cacti & Succulents

B. **CENTERPIECES:** (Accessories Permitted)
   1. Cacti
   2. Succulents
   3. Cacti & Succulents
   4. Dried Desert Material
   5. Mexican or Indian Inflence

C. **ARRANGEMENTS on/or AGAINST THE WALL —** (Accessories Permitted)
   1. Cacti
   2. Succulents
   3. Cacti & Succulents
   4. Dried Desert Material
   5. Mexican or Indian Inflence

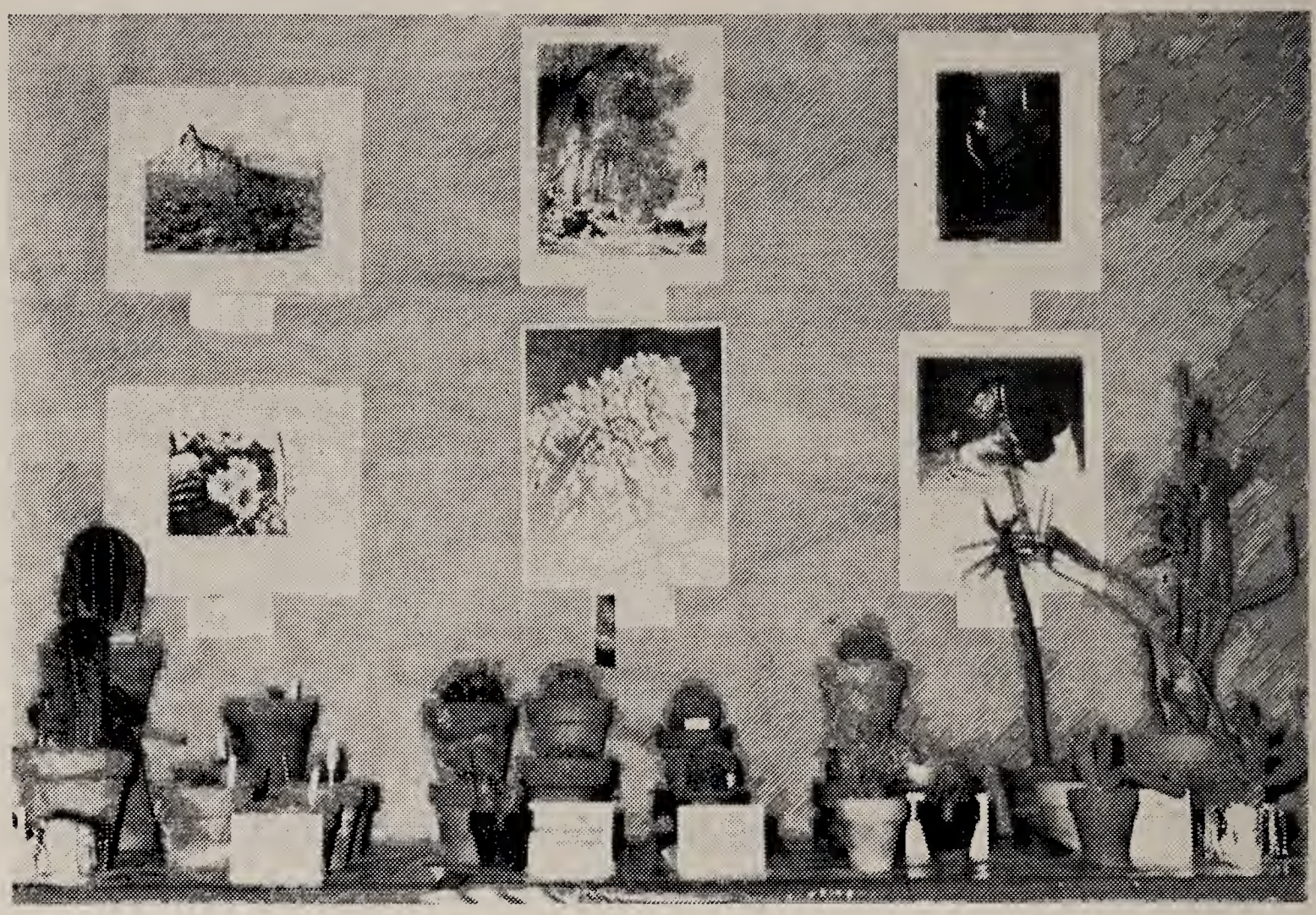
D. **CORSAGES:**
   1. Succulents
   2. Dried Desert Materials

E. **BUTTON GARDENS**

F. **MINIATURE ARRANGEMENTS**

G. **STRAWBERRY JAR**

H. **EDUCATIONAL**



A portion of the 1958 Show showing specimen plant entries and photographs in black and white.

Entries can be placed in space assigned after 1 P. M. Saturday, February 21st or before 10 A. M. Sunday, February 22nd. Exhibits can be removed Sunday, March 1, after 5 P. M. or on Monday, March 2nd. For additional information telephone BR 5-5592.

Exhibits Open to the Public

12 Noon Sunday, February 27th, 1959

Daily to March 1st, 9 A.M. to 5 P.M.

ENTRIES AND ADMISSION FREE

FACTORS IN THE CONTROL OF FLOWERING

By LOUIS E. BLANCHARD

Box 67, Crystal Beach, Ont., Canada

(Continued from the December issue)

The time mechanism for the production of florigen in long-night plants may be briefly described as follows: after June 21st, the nights are gradually longer, and the days are correspondingly shorter. At first, there is decidedly more than enough light to nullify or reverse the chemical reactions occurring in the dark. With the advancing season, the day arrives which requires its entire light period to completely nullify the florigen producd in the dark period. Thise represents the plant's critical night-length. With the lengthening night after this critical dark-period, more florigen is produced than can be inactivated by the progressively diminished light in any 24-hour period. The plant is now in its critical flowering period. At this time, flowering is possible because the proper balance of the continuously changing light-dark ratio is increasingly favorable for floral induction.

The minimum dark-period duration shows a wide variation in accordance with the innate character of the species. The regular alternations of periods of light and darkness are essential. The preceding light reactions (photosynthesis) produce the essential complex building materials and energy for the reactions in the dark. The regulating condition is a properly balanced composite factor — light and darkness. Several hours of midday darkening of long-night plants will not affect the time of blooming. On the other hand, a break of only 1 to 15 minutes will prevent flowering of sensitive plants in a dark period that would otherwise be sufficient for floral induction. Under natural conditions, plants receive much more light than they require for flowering. Thus the controlling factor in the critical flowering period is the length of the longest continuous dark period in any 24 hour cycle, and not the total period of either light or darkness.

About 1-3 hours (depending on the night length) of lighting of only 8 foot-candles capacity in the middle of the dark period will prevent bud initiation in chrysanthemums. Such faint light has no measurable effect of photosynthesis. It merely converts one long-night into two short-nights, but does not change the day-length. The critical night-length is the darkness value separating the inductive from the noninductive ranges of dark periods. As long as the induced short dark periods are each less than 9½ hours (critical dark period for chrysanthemums), the plant will remain vegetative; if longer than 9½ hours, buds will originate. Shading chrysanthemums with black cloth in the late afternoon to produce continuous darkness longer than 9½ hours, will initiate flower-buds even in the longest day of the year.

It is apparent that there is a definite relation between the growth-promoting hormone (auxin) and the flower-promoting hormone (florigen). Excess auxin appears to promote vegetative growth and inhibit flowering. In long-night plants the concentration of auxin apparently falls during the dark period and eventually reaches the level where the synthesis of florigen takes place. The excess florigen now inhibits vegetative growth and promotes floral induction.

Inasmuch as appropriate night-length is the floral inductive factor, it would

seem that spring-flowering plants, such again in the fall at the corresponding dark period. Such off-season bloom is usually present and can product fruit, unless killed by frost. Due to some environmental condition (e.g., nutrition, reach maturity, their critical floral period has passed, and the plants remain vegetative. In the fall, at their inductive night-length, such tardy plants respond with their first bloom.

Plants are genetically adapted to one complete reproductive cycle in a a year. It requires a full growing season and all available energy for adequate growth, food storage, and seed production. In spite of two critical flowering periods for spring plants, there is only one floral response; the necessary combination of all the essential factors for a second reproductive cycle is seldom present.

The seasonal time of blooming of short-day plants in their respective localities will vary with the latitude — in the direction north and south. Plants that bloom early in one part of the country, may be late in another. The type of Christmas cactus, Schlumbergera bridgesii, which flowers at Christmas in the region of Buffalo, N. Y., will bloom a month later in Miami, Florida.

After the autumnal equinox (Sept. 23d), the days get progressively shorter in the direction northward from the equator, until there is continuous darkness for 6 months in the circum-polar region. The opposite holds true in the summer season — the days are progressively longer, until there is continuous sunshine for 6 months in the Polar region — the land of the midnight sun. At the equator, the dark and light periods are about 12 hours with only slight winter and summer variations. The daily light and dark periods are due to the earth's revolution on its axis every 24 hours. The relative lengths of these periods depends on the degree of inclination of the earth's axis and the position of the sun.

One would expect a given variety of chrysanthemum planted on the same date, to flower earlier in balmy Florida than in New York. Paradoxical as it appears, the reverse is true. In New York, the critical dark period of 9½ hours arrives about 1 month earlier, and accordingly the plant blooms that much sooner. However, the chrysanthemum in Miami at blooming time will be at least a foot taller, as it had an extra month of vegetative growth.

Chrysanthemums normally bloom in the late autumn when the nights are long and the days are short. Commercial growers, however, now force these plants into bloom even in the long days of spring and summer. This is done, not by increasing the light but by daily darkening with black cloth or fibreen paper to obtain the critical dark period for floral induction.

The poinsettia is native to the tropics and its critical dark period is 12 hours. At about 42°N latitude (near Buffalo, N. Y.), flower-bud initiation occurs about October 20th and the plants must be grown in greenhouses. It is impossible for poinsettias to flower normally outdoors in northern gardens as they will be killed by frost before reaching their critical dark period.

The flowering dates of photoperiodically sentitive plants are genetically geared to the solar clock for blooming on a fixed schedule. The face of this huge imaginary clock in the earth's orbit around the sun. The position of the earth in this orbit represents the hand of the clock, and it indicates the season of the year which controls the succession of bloom.

Regardless of locality and diversity of flowering dates, all photoperiodically sensitive plants bloom on schedule — at their critical flowering period.

Another factor that modifies flowering is temperature variation and its effects on chemical reactions. The crucial factor in biological temperature require ment is the effect of heat on specific enzymes. Like chemical reactions in general, their activity is doubled for every rise in 10°F under normal conditions. Enzymes are unstable in excess heat. The diversity of this instability will vary with the genetic temperature adaptation of the species, and for this reason certain plants can only grow within narrow limits of temperature. A temperature of 50°F is beneficial for stocks, but fatal for coleus. Neither would live in the excessive heat of the desert, where cacti flourish.

At temperatures above the optimum, the rate of chemical reactions decreases due to the inactivation or destruction of essential enzymes. In short exposures to excessive heat, the recovery may be complete on cooling, but if the exposure is prolonged, certain enzymes may suffer partial or complete irreversible destruction. For this reason, high afternoon temperature in greenhouses will delay the flowering response of chrysanthemums. In mild heat of 105°F, the blooming period may be delayed several weeks beyond the anticipated schedule. With peak heats of 110°F this retardment may be four or five weeks. Severe heat partially inactivates essential enzymes and the plant responds with small misshapen blooms which frequently do not fully open. In the southern part of the country where afternoon temperature peaks in greenhouses may rise to 120°F, the growth of chrysanthemums is impossible due to total inactivation of the floral hormone. At high temperature, additional damage occurs from the loss of sugar due to excessive respiration. The loss is negatively correlated — the higher the excessive heat, the lower the sugar content.

Plants are economically adapted to the diurnal thermoperiodicity of higher day temperature and lower night temperature. This is conducive to high sugar production during the day, and low sugar consumption at night due to diminished respiration in a cooler atmosphere. House plants do not thrive when grown in homes at a constant thermostatically controlled day and night temperature.

Low temperatures have a specific affect in the cyclic responses of deciduous trees, shrubs, and rhizomatous plants in temperate climes. In such plants, development is only possible when periods of high temperature alternate with periods of low temperature, such as take place in the summer and winter seasons. Cut branches in water from a tree or shrub in its period of rest before chilling, will not develop shoots even under the favorable conditions in a greenhouse. In later winter, after an adequate chilling requirement, cut branches from the same tree will rapidly develop new growth. Without the rigors of winter, there could be no glory of spring. The pathetic fallacy of believing that plants suffer in harsh winter weather has no physiological basis.

The rhythm of annual thermoperidicity requires a year under natural conditions, but can be shortened (or lengthened) by controlled succession of temperature. Unless deciduous trees, such as pears and peaches, are subjected to low temperatures (near freezing), they will not break their rest. This rest is not a dormancy or quiescence induced by adverse external conditions, such as unfavorable temperature or inadequate water supply; it is a suspension of growth genetically biochemical in nature,and persists under favorable growing conditions. Chilling favors a growth promoting hormone in the buds or removes the inhibitors of growth. Starch hydrolysis with sugar formation at low temperatures may assist nutritionally in promoting this response.

Deciduous trees and plants that are genetically adapted to northern climates canot be grown in subtropical regions. It requires temperatures of 5°-8°C to break rest, and these temperatures must last a definite number of hours which varies with the species. The required cool hours need not be consecutive as the chilling effect is cumulative. Varieties native to northern climates require a longer chilling period. Such species when grown farther south where there are fewer cool days, will require a longer period to break rest and will thus show delayed foliation. By contrast, native southern species with minimal chilling requirements, when grown farther north may break their rest so early as to be killed by frosts. Plant migration is definitely influenced by annual thermoperiodic adaptation.

Lily bulbs (Croft and Creole) for greenhouse culture are packed with peat in cases and kept in cold storage for about 5 weeks at 35°-50°F before planting. This procedure does not permit uniform cooling, and the more protected bulbs will respond with later blooming. Beet roots, cabbages and onions will continue to grow vegetatively unless they are subjected to cold treatment. These plants may produce flowers in one season like annuals if they are planted early enough to be checked by frost. A biennial is a plant that is genetically adapted to annual thermoperiodicity. Under controlled succession of temperature (cold and warm), a biennial grows as an annual.

Gassner (1918) discovered that controlled cold influences the flowering of cereal plants. Winter wheat or rye, when planted in the fall, germinates during the winter and flowers in the following summer. When sown in the spring, it grows vegetatively but never reaches the flowering stage unless the germinating seed is chilled for several weeks at near freezing temperatures before planting. This method of converting winter cereals into spring types is appropriately known as vernalization.

Eventually precise floral initiation of physiologically receptive plants may be chemically controlled. In Hawaii, where the seasonal variations of dark periods and temperatures are slight, pineapple plantations are sprayed with the synthetic hormone napthalene-acetic acid to induce uniform flowering and to economically control crop succession.

SUMMARY

Seasonal flowering is not a haphazard succession of bloom, but an orderly sequence that is predictable. Environmental factors, such as nutritional balance, favorable temperature, and light intensity have modifying effects on floral induction. Specific factors, such as night-length and low temperature, initiate and control flowering. The flower-promoting hormone (florigen) is produced only in a functionally balanced light-dark ratio — when the florigen is sufficient to inhibit the function of the growth-promoting hormone (auxin). The light reactions (photosynthesis) must precede the dark periods. This provides the essential complex building materials and energy for the reactions in the dark.

The time of blooming of photoperiodically sensitive plants in their respective localities will vary with the latitude, but they all bloom on schedule — at their critical flowering period. The sequence of cold winter and warm summer temperatures is a requisite for most plants in temperate climates. Controlled temperature sequence can change a biennial into an annual — winter wheat will grow as spring wheat when the seed is chilled before planting.

Excessive heat delays or inhibits flowering by enzyme inactivation and undue loss of sugar. Hormones initiate and control the various physiological functions. Synthetic hormones are now used to induce uniform flowering and to control crop succession. Nature's dynamic mechanism is a precise system governed by intricately interrelated biochemical controls.

SAGUARO LAND BULLETIN

DESERT BOTANICAL GARDEN of ARIZONA

FEBRUARY, 1959

Cactus & Succulent Arrangement by Mrs. Sylvia Hermann, consisting of Opuntia santa-rita, Aeonium arboreum var atropurpureum and Portulacaria afra.

REG-MANNING

SAGUAROLAND BULLETIN

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W. HUBERT EARLE, Editor

Volume 13 FEBRUARY, 1959 No. 2

Arizona Cactus and Native Flora Society

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Desert Botanical Garden of Arizona

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NOTES FROM THE CORNER OF THE EDITOR'S DESK

A BOARD MEETING of the Executive members was called by Chairman John H. Eversole and held with a dinner at the Desert Hills Hotel January 12th. All members and their wives attended with the exception of Mr. Wm. Eliot and Mr. Ed Burrall who have been on the sick list.

Financial and activity reports were given by Hubert Earle. The Board voted that $3,000 of our surplus be set aside into a savings account for future buildings.

Mr. Charles Mieg was appointed by the Chairman to meet with Dean Arnold Tilden of Arizona State University to formulate plans relative to doing research work in desert plants using the facilities of the University and the Garden. It is hoped that in the near future large grants may be obtained for this research work.

MEMBERSHIPS in the Garden have gone over the 500 mark during the holiday season. Our thanks go to those who sent in new memberships and those who have raised their memberships from the Active ($3.00) to higher classifications. Those who desire to keep the Active memberships may do so indefinitely. The new Student classification is for those who are attending High Schools and Colleges.

A year ago our memberships totaled 433. As of Jan. 12th, 1959, the membershipships were as follows:

Contributing members		506
Exchange	"	55
Publicity	"	5

This is the highest membership in the history of the Garden and we know that in a few years we will have over 1000 members. Did you know that the Saguaroland Bulletin goes to members in 21 foreign countries? We have had many requests from libraries over the country ordering all of the back issues of the Bulletin and in addition taking out memberships.

IDENTIFICATION CLASS of Desert Plants has had a record number attending each week. In the past we have been most happy with weekly classes of 20-30 persons but this winter's course has had 68 - 70 attending each week. There is certainly an increased interest in desert plants, their names and their uses in landscaping. This course will finish with an all-day Field Trip Feb. 11th, leaving the Garden at 9:30 and checking vegetation along the Bush Highway to the Verde River and Cottonwood Ranch.

The Spring course will begin Wed., March 4th and many persons have already signed up for it. There is no charge for the course but many of those who have attended other courses have taken out memberships in the Garden.

GIFTS, DONATIONS to the Garden during 1958 have been numerous and you should know where some of them have come from:—

Mr. C. J. Marenda, 2921 W. Coronado Rd., Phoenix — Unusual turtle shaped rocks from 4-corners area of Arizona.

Mrs. L. F. Stewart, 322 N. 11th Place, Phoenix — Large clusters of Echinopsis, Aloe variegata and Peanut cactus.

Mrs. Mary Orr Russell, Reserve, N. M. — Cactus, Pentstemons, plants and seeds of that area.

Mrs. Barrett Woodsmall, 4320 E. Marion Way, Phoenix — Large hard-rock maple lounge upholstered in brocade.

The Pete Jepson estate, Tempe Arizona — Large plants of Lemaireocereus marginatus and many other Mexican Cerei.

Mr. and Mrs. Iza Turner, 324 West Siesta Way, Phoenix; Mr. and Mrs. C. C. Pidgeon, 5235 N. 18th St., Phoenix; Mrs. Arthur Holt, 4648 E. Palm Lane, Phoe-

nix; Mr. John B. Hales, 822 N. 7th St., Phoenix; Mr. Wm. Blomquist, San Manuel, Arizona — Plants that have been planted in the Wm. Taylor Marshall Memorial area.

Mrs. Daisy Purdy, 307 E. Cherry Lynn Road, Phoenix — 14 years of back-issues of Arizona Highways magazine.

Mrs. Olive Eversole, 121 W. Berridge Lane, Phoenix — a Zeiss-Ikon Contaflex 135 camera.

Mr. Charles Mieg, Scottsdale, Ariz. — 1 lb. Poppy seeds, ½ lb. African Daisy seeds, ¾ lb. of Yucca rigida seeds, many cactus plants for the Marshall Memorial area, and cash donations.

Mr. John H. Eversole, 121 Berridge Lane, Phoenix — Land Polaroid camera with flash attachment, and cash donations.

Mr. and Mrs. Fred Stell, R.R. 4, Box 391-C, Mesa, Ariz. A unique Saguaro Cactus wood desk lamp.

12th ANNUAL CACTUS SHOW

Sponsored by the Phoenix Gazette and the Desert Botanical Garden will be held Feb. 22nd to March 1st in the Webster Auditorium at the Garden from 9 A.M. to 5 P.M.

A schedule of entry classifications is enclosed with this Bulletin to the Arizona mailings showing the corrected dates that were overlooked last month.

Indications are that there will be a record number of entries with many from various parts of the State. The Garden is being groomed for the large crowds who will see many improvements over the past year.

New educational exhibits are being built which should be of interest to the many visitors.

As our staff is small we will again need a large number of Volunteers who will give us a day or part of a day of their time to help us with the heavy expected attendance. Those wishing to help please phone BR 5-5592. Last year 68 persons gave from ½ day to 8 days of their time helping in the 11th Annual Cactus Show. They gave out Camera permits, issued Nature Walks, sold plants, acted as hosts and hostesses, answered impossible questions and kept the visitors happy.

Entries can be placed in the Show after 1 P.M. Saturday, Feb. 21st.

Entries will close at 10 A.M. Sunday, Feb. 22nd, at which time judging will begin with Mrs. C. J. Fuhrer, Alliance, Nebr., judging the Arrangements, Gardens, Centerpieces, etc.

Ribbon awards will be awarded to 1st, 2nd and 3rd in each classification. Three sweepstake trophies will go to the highest points obtained in each of the following: — Potted Cactus, Potted Succulents, Arrangements (Dish Gardens, Centerpieces, Corsages, Button Gardens, Arrangements on or against the wall, Strawberry Jars).

Trophy awards will go to 10 of the various classifications and to outstanding exhibits.

We are looking forward to another successful Show and we ask that you do not fail to attend and bring your friends.

ADD TO CACTUS SHOW ENTRY LIST

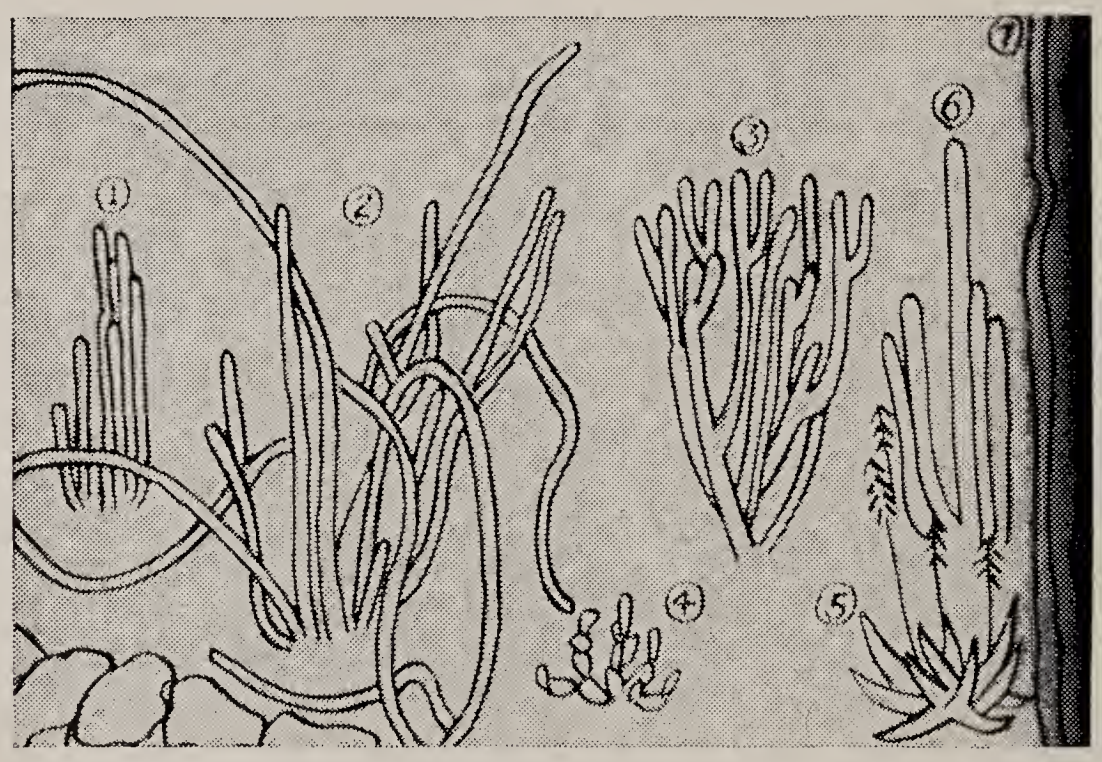
I — BLACK & WHITE PHOTOGRAPHS — Desert Subjects.

J—PAINTINGS, OIL, WATER COLOR, ETC. — Desert Subjects.

K — COMMERCIAL EXHIBITS.

A SUCCULENT DISH ENTRY by Mrs. Richard F. Williams, Phoenix.

ON THE GARDEN'S NATURE WALK



1. Monkey Tail (Cleisto cactus strausii). 2. Octopus Cactus (Rathbunia sonorensis). 3. Blue Myrtle Cactus (Myrtillocactus geometrizans). 4. Miniature Beaver-Tail (Opuntia basilaris var. ramosa). 5. Cape Aloe (Aloe striata). 6. Peruvian Cereus (Cereus peruvianus). 7. Giant Cactus trunk (Carnegiae gigantea).

COLLECTING SEEDS IN MEXICO

CHAS. MIEG, Scottsdale, Arizona

A lot of various seeds were collected by Hubert Earle, Andre Cuenound and myself on our Mexican trip last summer. Wildflowers and flowering shrubs were of particular interest to us with the thought in mind that some of the more spectacular plants might find a use as ornamentals in our country. A red flowering mallow which is perennial was such a plant. This one was located in eastern San Luis Potosi, Seeds were plentiful and we planted a number upon our return. Unfortunately these have not germinated and it is possible that they require a winter period before they get active. We will try again in Spring. Two Yuccas were of great interest to us, one Yucca australis is a very large plant, with trunk often over 6 feet thick and the plants up to 40 feet high with many branches which give the plant the appearance of an overgrown Joshua tree. These plants are fast growing, making up to 2 feet a year. While we found no ripe seeds, these were later provided by Fritz Schwarz, and we had good results from these plantings. Germination was about 85% but we were almost ready to give up as germination is slow. By trying some seeds between sheets of blotting paper we learned that germination takes not less than 4 weeks and the general average was seven weeks. In a few months I believe that, in three years from seed, these plants will be of commercial size and we should have a number in the garden for distribution.

The other yucca was not described as far as we could learn but no doubt a plant as prominent as this one must have been found and named. For lack of other name we called this one the silverblue Yucca after the color of the leaves. This plant is usually simple and straight with thin and stiff leaves about 3 feet long, the flower resembles that

X 1 1/3. Silver Blue Yucca. Possibly Yucca rigida.

of Yucca elata on an 6 to 8 foot vertical stalk. This very handsome plant appears to be slow growing, at least in its dry habitat of western Durango. Seeds were slow in germinating with from 1½ to 3 months were required before the first leaf shows. About 4 leaves per plant are the average to-day from seeds planted last July. These yuccas have a large underground wooden tuber, like our Yucca elata and probably these two plants are closely related.

Just south of Saltillo, at an elevation of about 6500 feet, we found a poppy in flower and seed. Similar to our California poppy but the flower color is a bright lemon-yellow. Enough seed was collected to seed our new Mexican bed in front of the Auditorium entrance and I have some planted at my own home. These seeds are also slow in germinating and usually take 3 weeks or longer. We have had trouble with birds on these seedlings and I have to keep mine under wire netting after losing all plants on the first planting.

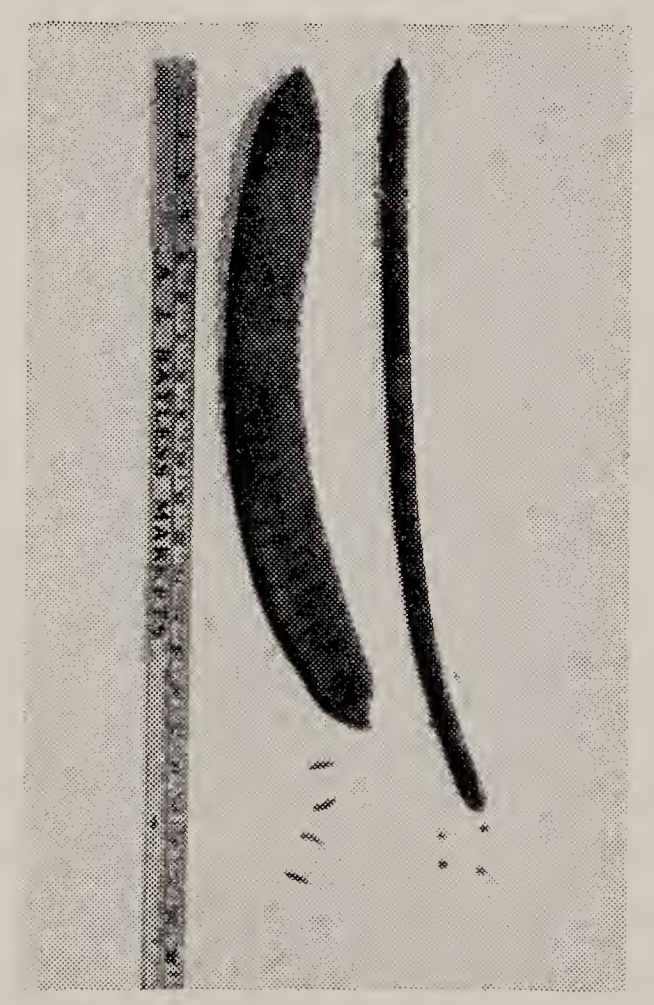
Seeds from a low Sage were taken in Durango.

This plant grows about 4 feet tall and has a blue flower. It is one of the

most striking plants growing in the desert and we should be able to grow this here without the plants requiring any particular care. Unfortunately germination was a failure. None of the carefully planted seeds came to life. Finally in disgust I dumped all remaining seeds into one pot and eventually 2 seedlings came up. The plants are now about 4 months old but not over one half inch tall. Possibly they will make better progress when hot weather returns.

Seeds of Tabuchin, or 'royal poinciana' were gathered in Cuernavaca and some of a slightly darked flower color near Los Mochis, Sinaloa. These were filed and boiled and satisfactory germination was obtained. These plants are very frost tender about on par with Jacaranda and must remain protected. Extreme heat though does not seem to bother them much. These trees, though common in tropical Mexico, are natives of Madagascar and we hope to establish a few on the warmer hillsides. I have now a three year old which is 8 feet tall and several smaller ones which are doing fine.

Seeds of Caesalpina pulcherima were collected south of Cuernavaca. This plant, related to our native 'bird of paradise' but with red to orange flowers grows into fair size bushes and is very spectacular when in flower which means for about 8 months of the year. Seeds had to be filed and put into boiling water before germination took place, but after such treatment this takes only 4 to 7 days when the weather is hot. In cold weather nothing happens. These plants are very frost tender and once established can use a fair amount of water. However as seedlings they are prone to 'damping-off' and by overwatering all plants were lost. The decomposed granite which is used in our new planting beds in the garden has been found to be an ideal medium for seedlings. No fertilizers are used.



17" seed pods of 'Royal Poinciana' and seed pods of an unidentified tree at Los Mochis, Sinaloa. Mex.

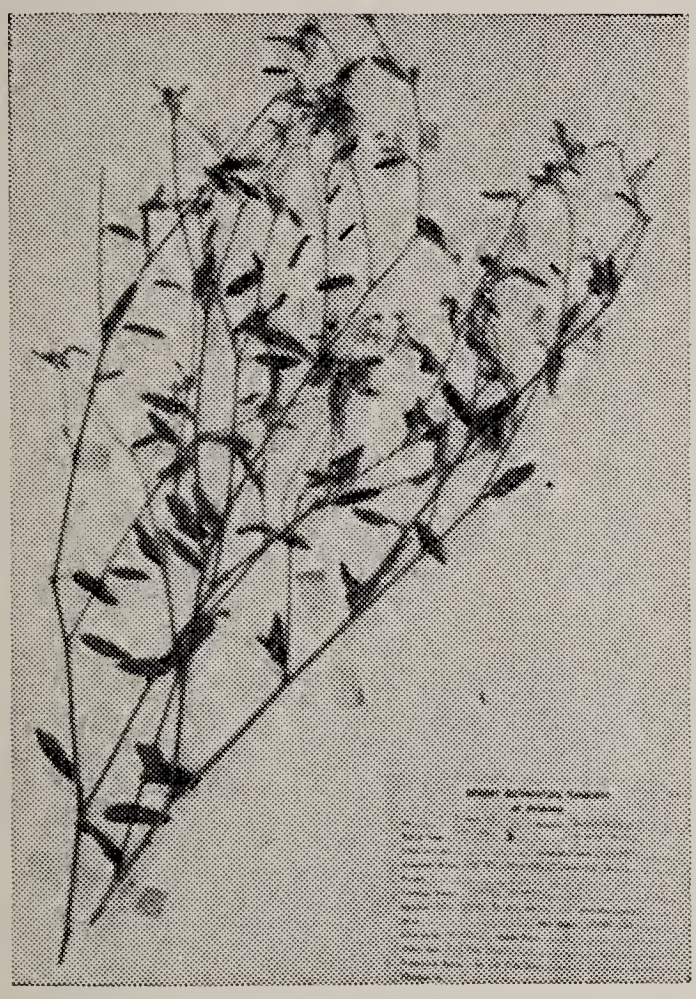
A bushy tree, known locally as Guaymuchil, is common over a large area south of Hermosillo. This tree resembles, from a distance, an Ironwood tree. In spring, after a rain these trees are covered with a dark blue flower which is the only color in a still brown landscape. For several years I have tried for seed from this plant but have not been successful. The seeds are a favorite food of the local rats and ground squirrels, 6 seeds were obtained at the agricultural inspection station in Nogales, but they were of unknown age and did not germinate. This tree would also make an excellent addition to our own desert gardens but I suspect that the plant is another very slow grower.

We believe that the wildflower seeds will reproduce enough this spring to make our plantings a permanent feature of the garden and expect to have a moderate amount of excess seed available to our members.

BARBASCO
CROTON WEED
SPURGE FAMILY

Croton texensis
Euphorbiaceae

BARBASCO is a silvery gray plant, with small whitish flowers, which grows from one to two feet high, depending on the locality. It is found on plains and hills and is common throughout New Mexico; in fact, many roads are so thickly bordered with the weed that its pungent odor is often mistaken for that of a skunk.



Herbarium sheet of a branch of Croton texensis.

In cases of paralysis, the patient is bathed in a strong infusion of croton weed, but a more elaborate, therefore a highly respected method, is that in which the body first is anointed with honey, then liberally sprinkled with a powder of the dried plant. If this is allowed to remain overnight, its soothing effect will be fully realized. Both kinds of treatment, however, are claimed to be efficacious and even the powder alone, when well rubbed over the skin, will give results.

Certain types of earache may possibly be alleviated by one of the seeds if it is placed in the ear with a bit of cotton or lamb's wool.

To relieve neuralgia or headache, the ground, dry plant or the green leaves are applied to the head; also the smoke of the dried weed may be inhaled for the same complaints.

The powder is kept on hand as a useful purge. As much as will go on the end of a knife may be taken in a quarter of a glass of warm water.

X 2/3 Croton texensis leaves and stems.

BARBASCO, however, gains its greatest favor as a household insecticide. It is thrown on a pan of hot coals in a sealed room whenever it becomes necessary to fumigate against bedbugs, which are a very common pest in the region. Another popular measure is that of putting the plant under the mattresses or it may often be seen hanging in bunches from the rafters.

One day when I was interviewing a jolly old 'medica' about this weed, she said in much seriousness, "You take a small grain, place it in your mouth — so ,drink a swallow of water and bang, all the bedbugs leave you!"

Croton is called "coyote leaf" by the Zuni Indians and, like the Spanish Americans, they use it as a purge. Furthermore, they believe in it as a diuretic and as a remedy for the stomach.

On the Hopi mesas where vermin are particularly prevalent, the people mix BARBASCO powder with white-wash for the interior of their houses.

Ethnobotanical excerpt from 'Healing Herbs of the Upper Rio Grande' — L. S. M. Curtin, Laboratory of Anthropology, Santa Fe, N. M.

Croton texensis is found throughout the central to southern part of Arizona. This annual will grow 2-3 feet in height and often called 'dove-weed' due to the many seeds it drops for the birds. Ranchers watch that this plant is not mixed in the hay as, it is reported, it will poison cattle.

BOOK REVIEW

CACTUS PERSONIFIED — Ladislaus Cutak. Wildcrafters Publications, Terre Haute, Ind., 1959. 116 pages, 54 drawings, 12 photos. $2.00.

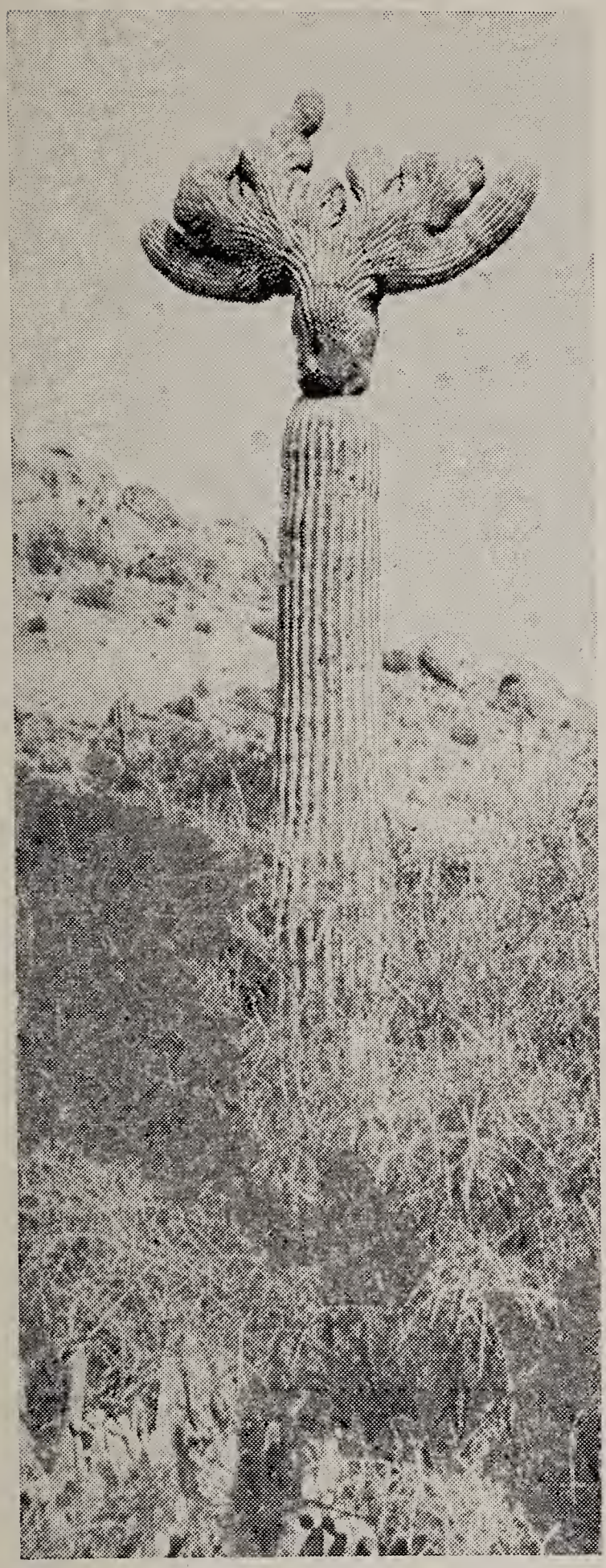
The cheesecake drawings of this book have finally 'leg-alized' cactus. A book of this nature will appeal to many and sales should be good. Facts are close to authentic, but, who will read these facts when they can oggle drawings.

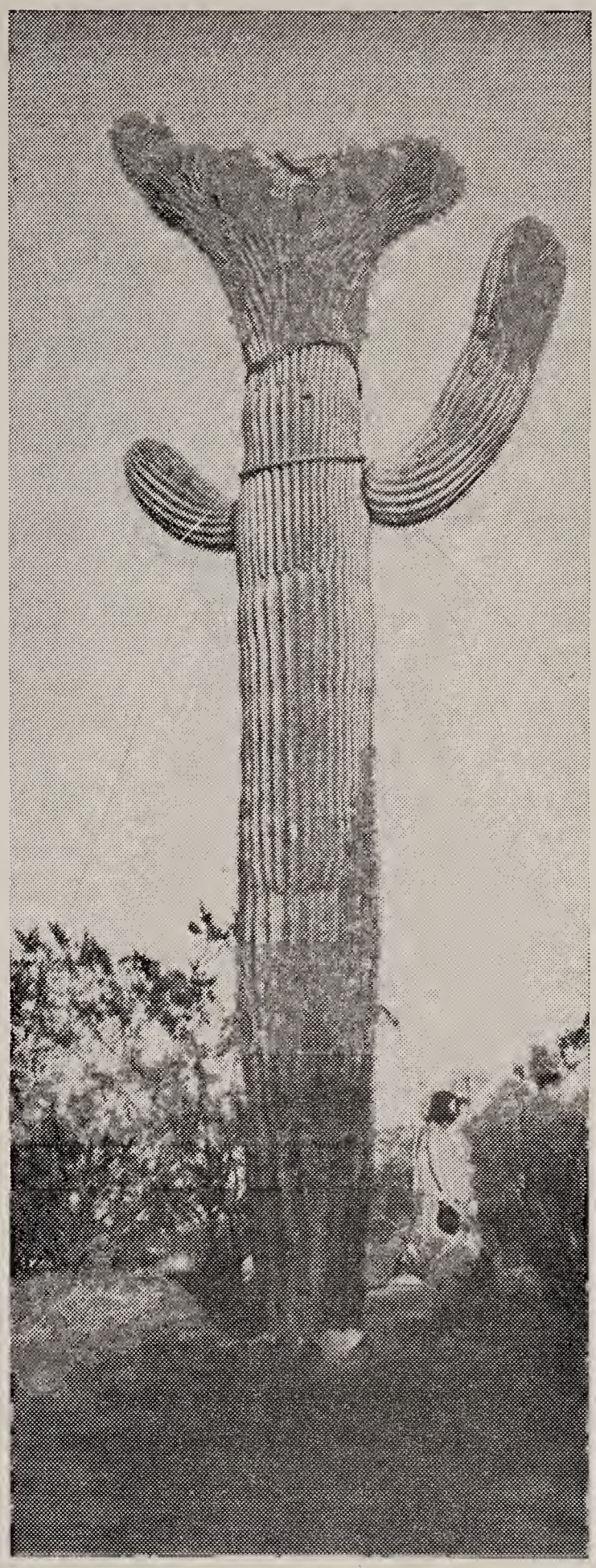
The travelogues are quite interesting and gives the reader a better idea as to the locale of the plant discussed.

Descriptions of the 53 cactus plants mentioned in the book are very good for the layman.

A limited number of these books can be obtained at the Desert Botanical Garden Book Store — 2.15 postpaid.

CRESTED SAGUAROS





The crested Saguaro on the left had been a familiar figure in the Garden since 1938. Last spring a family of Woodpeckers dug a new nest into which fell rain. The wound did not have a chance to heal and rot set-in, then the plant had to be removed in the summer. The crest on the right was a pleasant surprise from Chas. Mieg, a member of our Planning Committee.

Part of the November-December class on Identification of Desert Plants on a field trip.

CALENDAR OF EVENTS FOR FEBRUARY AT THE GARDEN

3rd 8 P.M. Cactomaniac meeting. Mrs. Monnie Speck showing slides of 'A trip through my back-yard'.

4th 3 P.M. Class — 'Wildflowers of Arizona'

5th 3 P.M. Lecture — 'National Monuments in Arizona'

11th 9:30 A.M. Class — Field trip to the desert.

12th 3 P.M. Lecture — 'Indians in Arizona'

19th 3 P.M. Lecture — 'Collecting plants in Mexico'

21st 1 P.M. Exhibits can be placed for Cactus Show

22nd 12 M. 12th Annual Cactus Show opens to the public to be open daily 9-5 P.M. to March 1st.

SAGUARO LAND BULLETIN

DESERT BOTANICAL GARDEN of ARIZONA

MARCH, 1959

A dry arrangement on a button
by Mrs. E. S. Tanner, Phoenix.

REG MANNING

SAGUAROLAND BULLETIN

Published and owned by the Arizona Cactus and Native Flora Society, sponsors of the Desert Botanical Garden of Arizona, P.O. Box 547, Tempe. Saguaroland Bulletin attempts to promote the Garden and to provide information on the desert plants and their culture. Subscription $5.00 per year, the subscription including active membership in the Society and the Desert Botanical Garden. Issued 10 times a year.

W. HUBERT EARLE, Editor

Volume 13 MARCH, 1959 No. 3

Arizona Cactus and Native Flora Society

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Desert Botanical Garden of Arizona

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Horticulturist ..... John H. Weber
Assistant Horticulturist ..... V. Edgar Jones
Student Horticulturist ..... Demetrios Vlachos

Garden open daily, including holidays, 9 A. M. to 5 P. M. from October 1st to June 1st.

REPORT OF THE 12th ANNUAL CACTUS SHOW

The 12th Annual Cactus Show held Feb. 22nd to March 1st in the Webster Auditorium of the Administration Building is now history with the largest attendance, 11,995, ever recorded. The shirt - sleeve weather was ideal for most of the visitors but some objected to the heat. There were many other activities going on at the same time in The Valley and we feel that we had more than our share of interested visitors.

Our co-sponsors, The Phoenix-Gazette, gave us excellent publicity a week prior to and during the week of the Show with stories by Reporter Linn Brown and Photographer Dick Straus. The Desert Magazine, Denver Post and Des Moines Register also carried articles about the Show.

We are most fortunate in having the Show roll along so smoothly each year due to the generous help of our volunteer members and others interested in the Garden. This year 44 members and 26 volunteers worked during the eight days of the Show and deserve credit as follows: 8 days — Mr. and Mrs. H. Pratt; 6 days — Mr. and Mrs. Otto Friedrichs, Golden, Colo., Mrs. Harold Covert; 3 days — John Hales, Warner Dodd, Don Bauer, Mrs. G. Frobert, Mrs. A. Holt; 2 days — Mrs. Wm. Baldwin, Mr. and Mrs. George Lamb, Howard, Ill., F. M. Harrington, Boseman, Mont., James Cahill, Wm. Rand; 1 day — Mr. and Mrs. W. G. Cook, Mr. and Mrs. Niedermeyer, Mr. and Mrs. T. O. Treadway, Mr. and Mrs. S. Macri, Andre Cuenoud, Mrs. Carl Paul, Mrs. Mrs. Una Miller, Mrs. D. Henson, Faith Carl, Bertha Jackson, Mrs. C. R. Little, Mr. and Mrs. Dugan Lewis, Trudy Muller, Mrs. S. P. Spanger, Mrs. S. P. Spangler, Jr., Connie Willemsen, Mrs. Ray Ashley, Mrs. Max Connolly and Mrs. Charles Maxted. Twenty six students of Dr. J. McCleary's Botany class at Arizona State University each helped half a day.

Our Members and Volunteers acted as hosts, hostesses, directed traffic, did Guide service, answered many questions, helped behind the Sales counter, issued Camera permits, sold Nature Walks and aided Mrs. W. H. Earle serve 161 noon meals to those who worked all day. Again may we extend our thanks to those who took time away from their homes and jobs to help during the Show.

Again we had an excellent judging of the exhibits and all were quite satisfied. Judging of the Arrangements, Dish Gardens, etc., was done by Mrs. C. J. Fuhrer, Alliance, Neb with the aid of clerks John Hales and Don Bauer. Judging of the Potted Cactus and potted Succulents was by K.R.S. Fisher, Mesa, Arizona and aided by clerks William Rand and Warner Dodd.

We had to set up some extra tables this year and staged the exhibits in tiers which showed-off the plants to their best. 224 entries by 31 exhibitors kept Entry Clerks Mrs. A. Holt, John Hales and Warner Dood busy in placing the plants and exhibits.

We attempted to stress educational exhibits this year and were pleased with the results. An outstanding exhibit of Hay Fever Pollen Plants by Instructor Dave Walkington of Arizona State University Botany Dept. received much attention. Mrs. Biechele, Sunnyslope, Arizona exhibited several trays of Cactus seedlings only a few weeks old, visitors could hardy believe that some of the small Saguaro seedlings would grow up to 250 years. Mr. and Mrs. Earle Lyon, Springbrook, Wisconsin, showed an interesting series of eight Kodachrome slides taken over a period of eight years of Mrs. Lyon standing beside the same Saguaro in the Garden's desert area. In the in-

terim of 8 years the Saguaro had grown from about 3'-6" to 7'-6" or averaged about 6" a year which is a fast rate of growth for a Saguaro in the dry desert, since the popular conception is that they grow only an inch or so a year.

AWARDS
SWEEPSTAKES

Cactus — John Hales, 322 N. 7th St. Phx.

Succulents (Tied) — Mrs. N. M. Blomquist, 321 N. 4th Ave., Ph., Mrs. Harold Covert 119 W. Dobbins Rd., Phx.

Arrangements — Mrs. E. S. Tanner, 2250 N. 17th Ave., Ph.

Trophy awards:

Best Dish Garden — Mrs. S. P. Stevens, 120 W. Missouri, Phx.

Best Centerpiece — Mrs. R. I. Turner, 324 W. Siesta Way, Phox.

Best Arrangement against wall — Mrs. Carl Paul, 6094 Cheney Rd., Scottsdale.

Best Cactus — Mrs. Laura Nixon, 1541 E. Willette, Phx.

Best Succulent — Mrs. N. M. Blomquist, 381 N. 4th Ave. Ph.

Best Educational — Botany Dept. A.S.U. Tempe.

Best Strawberry Jar — Mrs. A. Holt, 4648 E. Palm Lane, Phx.

Best Minatures — Mrs. E. S. Tanner, 2250 N. 17th Ave., Phx.

Best Painting — Mrs. Sally Feese, 3136 N. 37th St., Phx.

POTTED SPECIMENS: CACTUS

Mammillaria — 1, 2, 3, J. Hales, 822 N. 7th Street.

Corypantha — 1, J. Hales; 3, Ed Stocks, 812 Lemon Street, Tempe.

Opuntia — 1, 2, 3, Ed Stocks.

Thelocactus — 1, 2, J. Hales

Echinomastus — 1, Dugan Lewis, 3135 Grand Blvd.; 4, Don Bauer, 1421 E. Thomas Rd.

Echinofossulocactus — 3, Isabelle Holt, 4648 E. Palm Lane; 4, Bill Rand, 2605 W. McLellan.

Lobivia — 1, 2, Mrs. Geo. Probert, 235 W. Euclid; 3, Mr. and Mrs. Warner Dodd, 4723 N. 7th., Ave.

Echinopsis — 1, Laura Nixon, 1541 E. Willette; 2, J. Hales; 3, Mrs. E. S. Tanner 2250 N. 17th. Ave.

Astrophytum — 2, Mrs. Richard Williams, 1429 E. Brill.

Cereus — 1, Don Bauer; 2, 4, J. Hales; 3, Ed Stocks.

Ariocarpus — 1, Bill Rand; 2, Isabelle Holt; 3, 4, J. Hales

Echinocereus — 1, Don Bauer; 2, 3, Ed Stocks.

Gymnocalycium — 1, J. Hales; 2, 3, Mrs. Richard Williams.

Barrels (Ferocactus or Echinocactus) — 1, Mrs. E. S. Tanner; 2, Ed Stocks.

Any Other Species — 1, 3, J. Hales; 2, R. I. Turner, 324 W. Siesta Way.

Seedling Cactus — 1, Lois Biechele, 1727 W. Mt. View Rd.; 2, Don Bauer.

Crested Specimens (Own Root) — 1, Mrs. Ed Speck, 3926 S. 3rd. Ave.; 2, 3, 4, J. Hales.

POTTED SPECIMENS: SUCCULENTS

Euphorbia — 1, J. Hales.

Dudleya — 1, 2, 3, Isabelle Holt.

Kalanchoe — 1, 3, Mrs. N. M. Blomquist, 381 N. 4th. Ave.; 2, R. I. Turner.

Aloe — 1, Mrs. Geo. Probert; 2, Mrs. Harold Covert; 3, Ed Stocks.

Sedum — 1, Mrs. S. R. Stevens, 120 W. Missouri.

Echeveria — 1, Mrs. & Mrs. Warner Dodd; 2, Mrs. N. M. Blomquist.

Haworthia — 1, 3, Bill Rand; 2, 4, J. Hales.

Agave — 1, Isabelle Holt; 2, 3, Ed Stocks.

Crassula — 1, Mrs. S. R. Stevens; 2, Mrs. Harold Covert.

Mesembryanthemum — 1, Mrs. Harold Covert.

Any Other Species — 1, Mrs. S. R. Stevens; 2, Mrs. N. M. Blomquist; 4, Isabelle Holt.

Desert Trees and Shrubs — 1, J. Hales; 2, Mrs. Harold Covert.

Aeonium — 1, 2, Mrs. N. M. Blomquist; 3, Laura Nixon.

Gasteria — 1, Mrs. Harold Covert; 2, Mrs. Clinton Campbell, 361 N. 4th Ave.; 3, Mrs. Richard Williams.

DISH GARDENS:

Cacti — 1, Mrs. Richard Williams; 2, Mrs. E. S. Tanner; 3, Mrs. S. R. Stevens.

Succulents — 1, Mrs. S. R. Stevens; 2, Mrs. Richard Williams; 3, Mrs. E. S. Tanner.

Cacti & Succulents — 1, Mrs. Richard Williams; 2, Mrs. E. S. Tanner; 3, 4, Jan France.

CENTERPIECES:

Cacti — 1, R. I. Turner; 2, 3, Mrs. Harold Covert.

Succulents — 1, R. I. Turner; 2, J. Hales; 3, Mrs. Geo. Probert; 4, Mrs. Myron R. Holbert 608 E. 3rd. St. Scottsdale.

Cacti & Succulents — 1, Mrs. Harold Covert; 2, R. I. Turner; 3, Jan France.

Dried Desert Material — 1, R. I. Turner; 2, Mrs. E. S. Tanner; 3, Mrs. Glenn Hodson, 6841 E. Thomas Rd., Scottsdale; 4, Mrs. Owen Lindley, 21 N. Price, Mesa.

Mexican Influence — 1, Mrs. Richard Williams.

American Indian Influence — 1, R. I. Turner.

ARRANGEMENTS ON/OR AGAINST THE WALL:

Cacti — 1, R. I. Turner;

Succulents — 1, Mrs. Ed Speck; 3, Mrs. S. R. Stevens.

Cacti and Succulents — 1, Mrs. E. S. Tanner; 2, Mrs. Carlton Paul, 6094 Cheney Rd., Scottsdale; 3, Mrs. Richard Williams; 4, R. I. Turner.

Dried Desert Material — 1, Mrs. Glenn Hodson; 2, Mrs. E. S. Tanner; 3, Mrs. G. McClune, 7731 N. 17th. Ave.; 4, Gloria Bauer, 1421 E. Thomas Rd.

Mexican Influence — 1, Mrs. Carlton Paul; 2, R. I. Turner.

American Indian Influence — 1, Mrs. Richard Williams; 2, Mrs. Harold Covert.

Corsages — 1, Mrs. S. R. Stevens.

Succulents

CORSAGES:

Dried Desert Material — 1, Mrs. S. R. Stevens; 2, Mrs. Glenn Hodson.

BUTTON GARDENS — 1, 2, Mrs. E. S. Tanner.

MINIATURE ARRANGEMENTS 5"-8" — 2, Mrs. Harold Covert.

MINATURE ARRANGEMENTS UNDER 5" — 1, 1, 2, 3, Mrs. E. S. Tanner.

STRAWBERRY JAR — 1, Isabelle Holt; 2, 3, J. Hales.

EDUCATIONAL EXHIBITS — 1, Lois Biechele; 2, Mr. and Mrs. Warner Dodd; 3, Mrs. Harold Covert.

BLACK AND WHITE PHOTOGRAPHS — 1, John Eversole, 121 W. Berridge Lane; 2, Sally Freeze, 3136 N. 37th. St.

USE OF DESERT WOODS — 1, Fred Stell, Bush Highway; 2, John J. Fry, Rt. 2, Mesa.

PAINTINGS:

Oils — 2, Isabelle Holt.

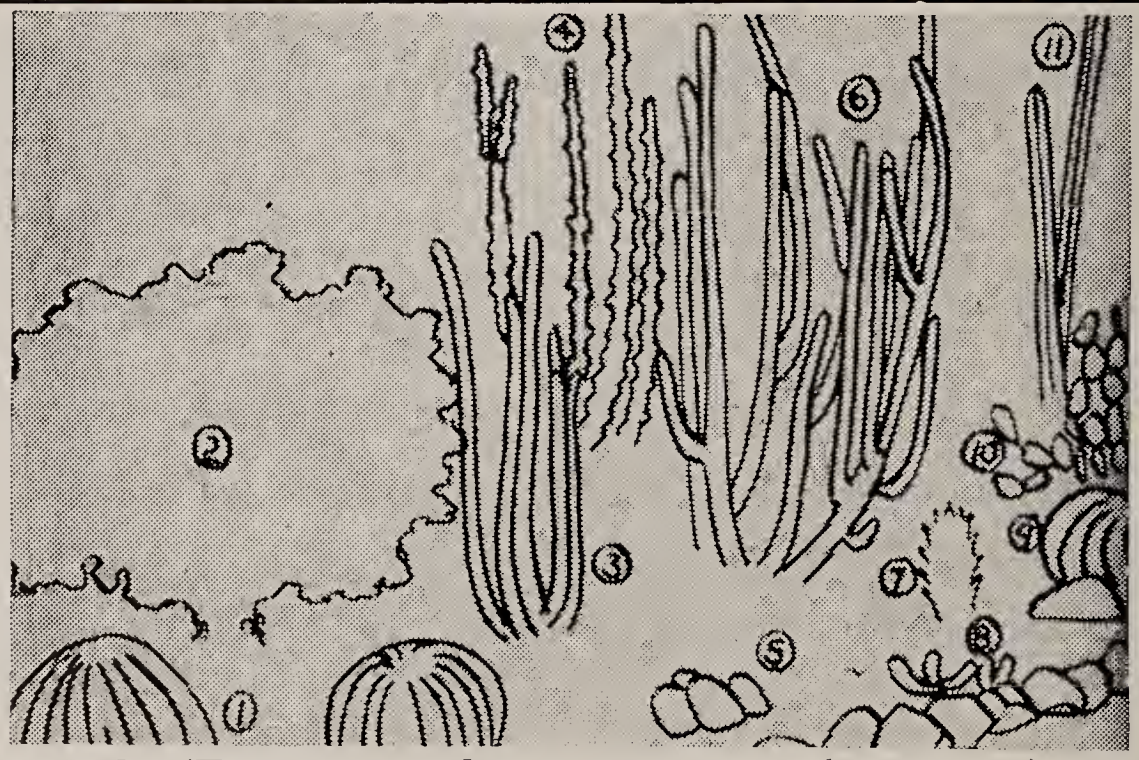
PENCIL SKETCH — 1, Isabelle Holt.

WATER COLOR (Framed) — 1, 2, Isabelle Holt.

WATER COLOR (Unframed) — 1, Sally Feese; 2, 3, Ignatius Banasewiez, 612 N. 16th St.

NOVELTY ARRANGEMENTS — 1, 2, Mrs. Paul Carlton.

ALL PHOTOGRAPHS IN THIS ISSUE WERE TAKEN BY JOHN H. EVERSOLE



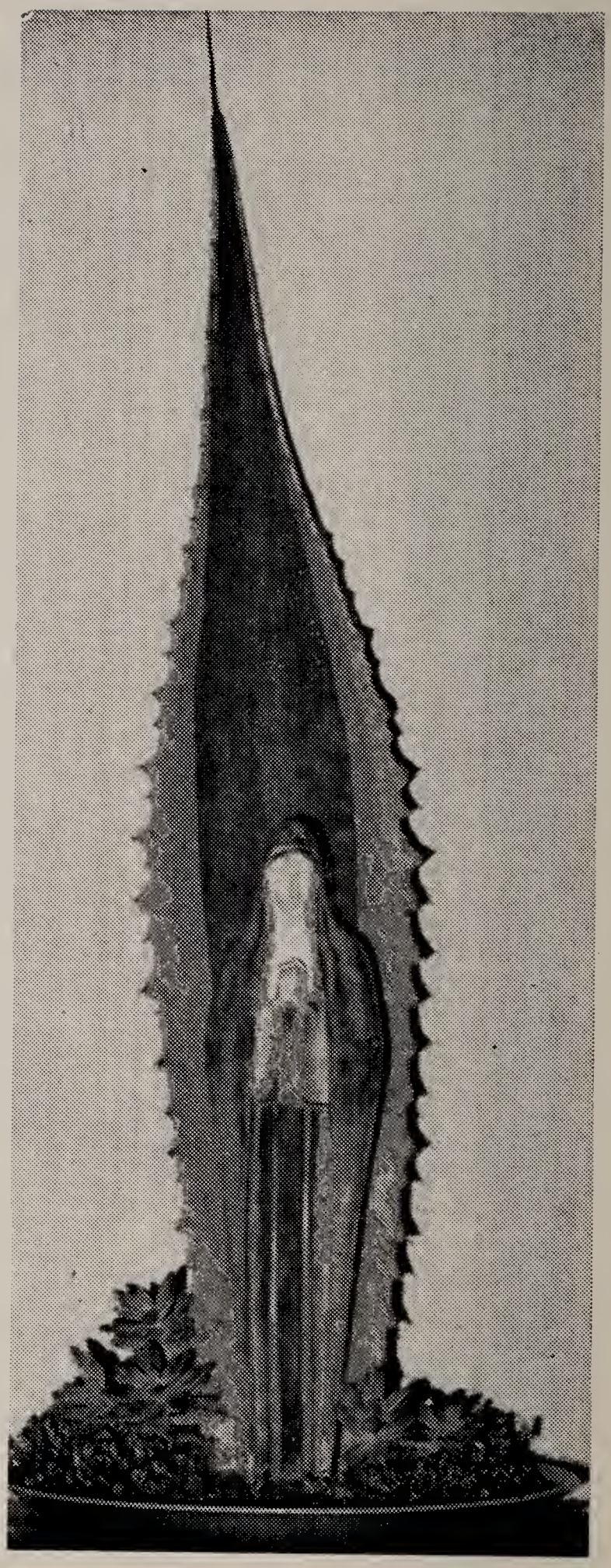
1. Melon Barrels (Ferocactus alamosanus var. platygonus). 2. Feathery Cassia (Cassia artemisoides). 3. Organ Pipe (Lemaireocereus pruinosus). 4. Totem Pole (Lophocereus schottii var obesa). 5. Coryphantha recurvata. 6. Organ Pipe (Lemaireocereus stellatus). 7. Red Barrel (Ferocactus coloratus). 8. Silver Torch (Hamatocactus setispinus). 9. Ferocactus latispinus. 10. Purple Prickly Pear (Opuntia santa-rita). 11. Organ Pipe (Lemaireocereus marginatus).

Educational exhibit by Instructor Dave Walkington and some of his students.

Portion of the Potted Cactus exhibit, Paintings and Photographs.

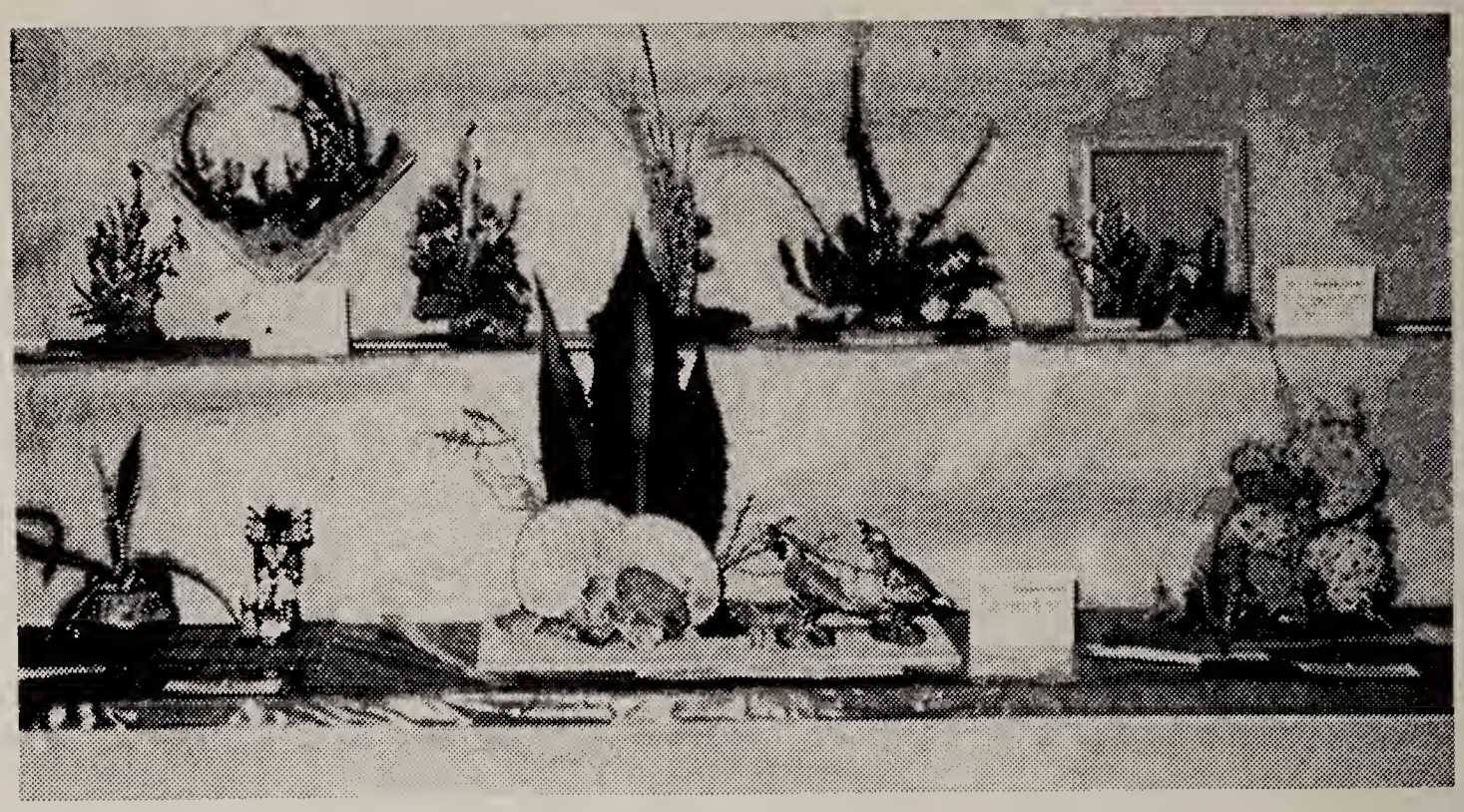
Part of the Section on Potted Succulents.

Arrangement against the wall showing a Japanese influence using Ocotillo branches by Mrs. C. Paul, Scottsdale.



Succulent arrangement against the wall by Mrs. Ed. Speck, Phoenix.

A trophy winning Arrangement against the wall
by Mrs. Carlton Paul, Scottsdale.



Section of Arrangements against the wall. Cactus, Dried Material and Succulents.

CALENDAR OF EVENTS FOR MARCH AT THE GARDEN

3rd	8 P.M.	Cactomaniac meeting — Mr. O. W. Timberman will show slides on Mexico's 'Diamond in the Rough' — Lower California
4th	3 P.M.	Spring Class — Identification of Desert plants
5th	3 P.M.	Lecture — Arizona Wildflowers
11th	3 P.M.	Class — Desert Succulents
12th	3 P.M.	Lecture — Arizona Scenics
18th	9:30	Class Field trip to Pinnacle Peak area
19th	3 P.M.	Lecture — Arizona Trees & Shrubs
25th	3 P.M.	Class — Trees and shrubs of the desert
26th	3 P.M.	Lecture — Arizona Birds, Reptiles and Animals

SAGUARO LAND BULLETIN

DESERT BOTANICAL GARDEN of ARIZONA

APRIL, 1959

Arrangement on a Button — note the
1 cent piece to the right.
Exhibited by Mrs. E. S. Tanner.

REG MANNING

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W. HUBERT EARLE, Editor

Volume 13 APRIL, 1959 No. 4

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Desert Botanical Garden of Arizona
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Student Horticulturist ... Demetrios Vlachos

Garden open daily, including holidays, 9 A. M. to 5 P. M. from October 1st to July 1st.

ANNUAL MEETING

The Annual meeting of the Arizona Cactus and Native Flora Society, sponsors of the Desert Botanical Garden, will be held Sunday, April 19th, 3 P. M., in the Webster Auditorium at the Garden.

Under our By-Laws, such a meeting must be held yearly on the 3rd Sunday in April for the purpose of electing officers into the Society for the coming fiscal year, May 1st, 1959-April 30, 1960.

Since our members, who are entitled to the right to vote, are scattered over the country, we are enclosing a ballot with this Bulletin so that you can vote for the three names listed on the postal ballot by the nominating committee. Space is also provided for any "write-ins."

We urge you to mark your ballot with X's and mail it at once so that it will arrive at the Garden not later than April 18th.

READER'S DIGEST

Cover for April was made in the Garden by their Art Director — Robert H. Blattner, last year.

Suggest that you look at it closely for it is an excellent job of detail and trueness of color. The petal's mid-rib stripes of the small Mammillaria microcarpa, center lower left, show a delicate pink coloration — characteristic of the blossom. The flame-red Ocotillo, upper right, is quite an eye catching blossom.

The title of the cover is "Southwest Spring" and most of the plants pictured are now in bloom at the Garden. We did not get any credit as to where the cover was made but the Reader's Digest Foundation presented us with a large check to be used on one of our research projects for which we gave them our thanks.

DESERT FIELD TRIP

GEORGE N. LAMB, Howard, Illinois

In spite of the fact that I'm a freshman member of the Arizona Cactus & Native Flora Society, Mr. Earle has asked me to report on the field trip of February 11th taken by the winter class on 'Identification of Desert Plants'. By so doing, he has become a member of the "Let George do it" Society. The only qualification I might have for the job is that I have had considerable experience in the rain forests of tropical America. The rain forest is lush, while the desert plants have only a stingy amount of water come their way.

About the only thing that the desert and the rain forest have in common is the ability to torture human beings with saw-edged, spingy branches and leaves. However, when it comes to finding water, the jungle is no bargain in the dry season. Even so, I would rather quench a thirst with a section of a 'bejuca' vine than to attempt to get water out of a barrel cactus.

But let's get on with the report on a very interesting and informative trip. The caravan left the Garden at 9:30 twelve cars strong. In the group there were 44 persons from 15 States. We headed north-east from the Garden on the Bee Line Hwy towards Payson, and our first stop was at a spot north of where the highway crossed over the Arizona Canal.

I started to jot down the half dozen names of plants that I expected to find at our first stop, but to my amazement, the list of plants that Mr. Earle identified and briefly described ran to 24 species. This was quite a production from a couple of acres of rather nondescript and sparsely covered real estate.

Canotia holocantha
Desert crucifixion thorn

Some of the veteran members of the class prowled about and afield to discover more of the plants adapted to desert conditions. It was all so interesting that I continued making the list for the rest of the day. It will make for me a very good starting point for learning more about the rich flora of this seemingly barren land. We then stopped at four or five other stations at encreasing elevations.

We lunched on the bank of the Verde River at a spot that was not too verdant, and for the matter, not too much of a river. Later found out that water was being held back behind the Bartlett and Horse Shoe dams so that the river channel could be cleaned out of Salt cedar which is chocking the few flowing streams in central Arizona. Along the Verde River we found Sycamore, Cottonwood and Mesquite trees. It was a spot and an hour long to be remembered.

After 2 or 3 more stops for field work and the acquisition of specimen rocks by some of the party, we ended the field trip on the shore of Saguaro Lake. It was a pleasant finale particularly since I had the opportunity to make inquiry as to the fishing facilities at this point for the future.

Of the 76 plants we found it would be impossible for me to give any correct discription or classification but the list is available at the Desert Botanical Garden for comparison and use of any future groups who might make this same trip.

Canotia holocantha fruit
and stems ½x

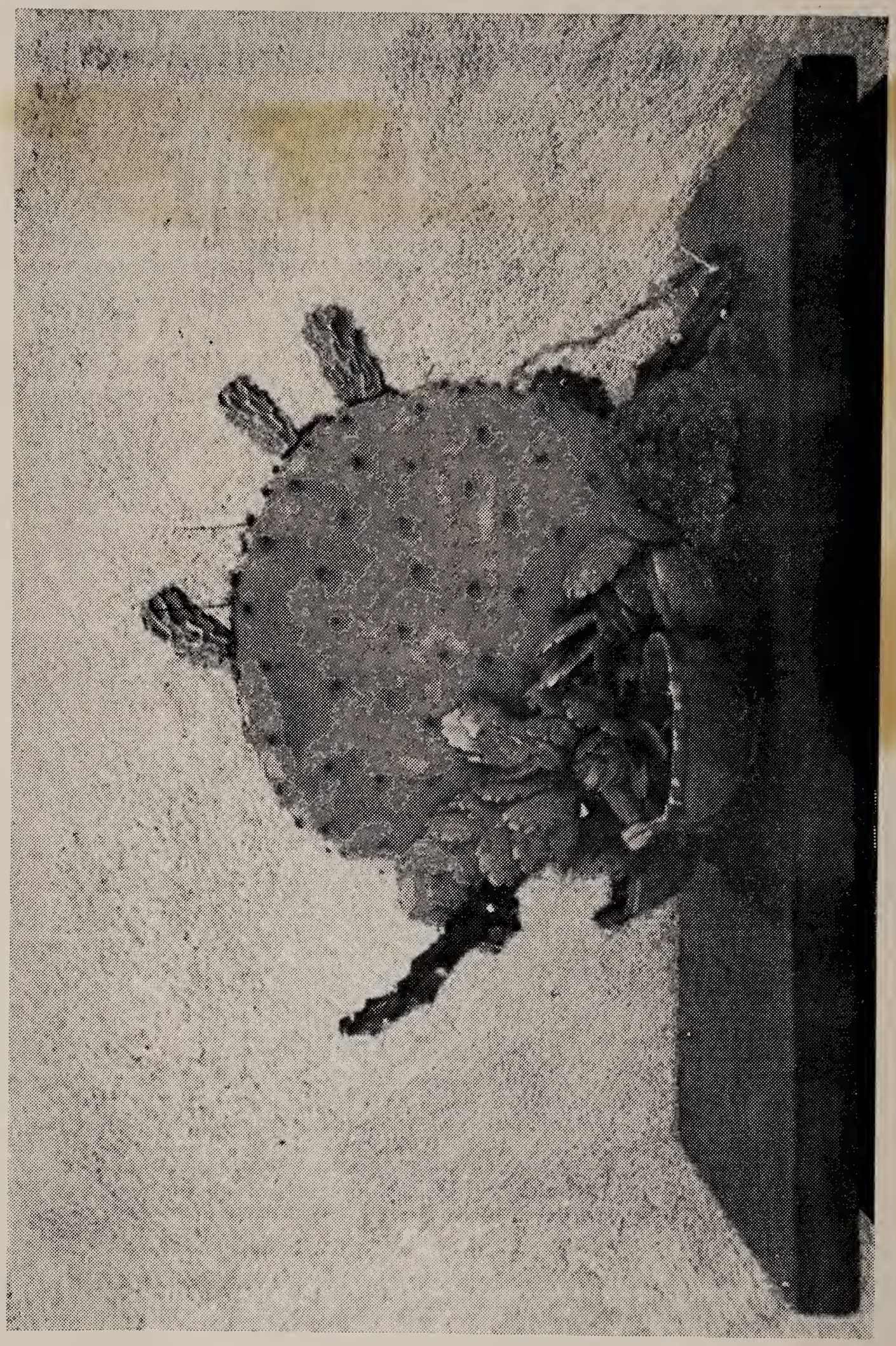
The following are a few of the plants we found that, because of flowering or some unusual characteristic, were of particular interest — Green Palo Verde, Blue-green Palo Verde, Brittle Bush, Hummingbird bush, Crested Strawberry Hedgehog, Ironwood, Mormon tea, Coffe bean (Jojoba nut), Spanish Bayonet, Crucifixion thorn, Leafless Milkweed, Leafless Mistletoe.

Mr. G. Lamb is secretary of the Mahogany Association Inc. and has a botanical and forestry background, is an authority on tropical woods of which he has a collection of over 2,000, and author of "The Mahogany Book" now in its 8th edition.

— Ed.

ON THE GARDEN'S NATURE WALK

1—Century plant (Agave nelsonii), 2—Ocotillo (Fouquieria peninsularis), 3—Hedgehog (Echinocereus engelmannii var nicholii), 4—Cholla (Opuntia cholla), 5—Totem Pole (Lophocereus schottii var. obesa), 6—Red barrel (Ferocactus coloratus), 7—Elephant cactus (Pachycereus pringlei), 8—Senita (Lophocereus schottii).



Centerpiece of Cacti and Succulents
Exhibited by Mrs. R. I. Turner

Strawberry Jar of Succulents
Exhibited by John B. Hales

Dish Garden of Cacti and Succulents
Exhibited by Mrs. Richard F. Williams

Centerpiece of Dried Desert Material
Exhibited by Mrs. Glenn Hodson

WATER BALANCE IN SOILS

By DR. LOUIS E. BLANCHARD

Water, the vital fluid of life, comprises about 90 per cent of the bulk of living plant tissues. It is not only an essential nutrient compound, but also enters chemically into the manufacture of foods. It acts as a general solvent; it is the medium for the plant's transpiratory and other physiological processes; it represents the liquid phase of the tissue colloidal systems; it is essential in photosynthesis. Humid region plants require ample moisture to maintain tissue turgidity and to replace the water lost through transpiration. Of the many factors involved in growth, the adequate supply of available soil-moisture is of prime importance. Where rain-fall is heavy, as in certain tropical regions, rank vegetation prevails. In the desert, with low rainfall, vegetation is scant and only such plants as cacti and other **xerophytes** that have developed a special capacity for the accumulation and retention of water, have been rewarded with existence in a rugged environment.

The sourse of moisture to plants is from the soil-water, and the available amount will depend upon the physical behaviors involved in the adjustment, retention and motion of this water.

When a small-bore glass tube (capillary tube), is placed in water, the liquid within the tube will rise against gravity to a point higher than its outside level. Inasmuch as the adhesion between water molecules and glass is greater than the cohesion between the water molecules, the fluid will moisten the glass and move upward, producing a curved effect at the liquid surface, known as a meniscus. The smaller the bore, the higher will be the rise as most of the water will be held by a strong adhesive force, and the cohesive force will therefore be able to support a tall column of water. In a large tube, a relatively small amount of water is held by adhesion, and cohesion will only support a short column. The elevation of the water-column for any tube increases as the diameter of its bore decreases, and this relation is known as an inverse proportion.

All liquid surfaces are under an elastic tension because of unbalanced cohesive forces. Molecules of water below the surface, are pulled equally in all directions by surrounding molecules and are therefore at equilibrium. At the surface, these forces act laterally and downward but not upward. This imbalance with its resultant downward force, so compresses the upper layer of water molecules, that it acts like an elastic membrane and is known as surface tension. Insects such as water spiders, move freely on this film. A clean steel needle, if laid carefully on water, will float. A rain drop is spherical because the contractile forces of surface tension compress it into the smallest possible volume. A bursting soap bubble breaks inwardly and illustrates the contracting nature of a film. Surface tension varies with the curvature of the film and is greater in a small capillary tube than in a larger one. A small drop of water has a greater film curvature than a large one, and is under greater surface tension. This force is curvature. A small capillary tube with half the radius of a larger one, will have twice the pulling power.

Any material that has a large amount of surface surrounding small communicating tubes and spaces, such as blotters and wicks, will possess good capillarity. The soil is such a structure with a intricate maze of tortuous pores and spaces in which the dynamic properties of water are similar to those described in capillary tubes.

When water is applied to a soil, whether by rain or artificial methods, there is a retention due to energy factors involved. The retentive forces that hold soli-water against the pull of gravity are adhesion, or the mutual attraction between soil and water; and cohesion, or the attraction of water molecules for each other. This force of retention is expressed in terms of centimeters of height of a unit column of water that produces a tension of equal magnitude. Inasmuch as greater centimeter heights indicate greater force, we may express this force in gravity units.

Certain forms of water, such as is held by colloidal adsorption, are retained with such enormous force that it would require for their removal, a force equivalent to the weight of a column of water over a million centimeters in height. To avoid the use of such cumbersome figures, these energy values are expressed in terms of their logarithms or as pF values. The symbol p indicates a logarithmic value and F implies energy. A pF of 2 has the force equivalent to the weight of a column of water 100 centimeters (10 x 10) in height. 1000 centimeters (10 x 10 x 10) would correspond to a pF of 3 and so on. The maximum force of water retained would be about 10,000,000 centimeters, or a pF of 7. The method of calculation is similar to that employed in interpreting the pH of soil reactions.

When soil is saturated with water and allowed to drain, the amount of moisture retained is designated as **field capacity.** It has been shown experimentally that the amount of water held in a column of soil at field capacity, has an average film tension of about ½ atmosphere (pF 2.7). At the base of the column ,the water is held at a pF of Zero. Water that is held at momentary equilibrium in a soil that is not connected with a water table, has a negative pressure of about ½ atmosphere at all fronts.

The removal of water by gravity, is called drainage or **gravitational water** and this occurs at a pF of 2.7 and below. A pF of 2.7 is equivalent to a unit column of water about 500 centimeters in height or approximately ½ atmosphere of pressure. The weight of air at sea level or atmospheric pressure, equals 14.7 lbs. per square inch.

Moisture retained by soil within certain energy ranges are classified as **hygroscopic, capillary** and **gravitational.** Air-dry soils have small amounts of water held by adhension. The percentage of such adsorbed moisture is designated as the **hygroscopic coefficient** and varies with the colloidal content of the soil and the humidity of the air. Hygroscopic water represents a very thin film tenaceously held at about 10,000 atmospheres of pressure (pF of 7) and is therefore immovable, unavailable and has no biological significance. The hygroscopic coefficient shows marked variations according to soil types. Where the organic content is low, as in a sandy loam, it may be only 1 or 2 per cent by weight. In a heavier soil with 5 per cent organic matter, it may be as high as 15 per cent; in peaty soils, it may reach 70 per cent. It is obvious that high organic soils may contain large amounts of water in an inactive or unvailable form. Recently in our shaded greenhouse, bench grown Impatiens plants wilted in a peaty soil mixture that was palpably moist. However, the application of more water corrected this condition. Because of the high hygroscopic coefficient of peat, this particular affinity for water at high tension levels must first be satisfied, before any moisture at low tension levels will be available for plant consumption. It is apparent, that in comparing soil moistures, the percentages may be mis-

leading, as only the increment of water at low capillary tension is of biological importance. Soils high in organic matter have an increased total water-holding capacity and do not dry easily, but must be kept wetter for ample available moisture. The capillary tension, rather than the percentage of water is of prime importance. With light watering or rainfall, a mulch of peat may actually reduce the water intake by absorbing the moisture and losing it to evaporation.

Gravitational water is transient and soon lost. It rapidly passes downward to a level where all pore spaces are filled with standing or **hydrostatic water**. With good drainage, such a condition in the upper soil layers would only be temporary, with no adverse biochemical changes. Where drainage is inadequate, the air is excluded and toxic products that cannot be oxidized accumulate. In such a medium, the pathogenic anerobic bacteria flourish and normal biological chemical activities are impossible. Such anerobic putrefaction is associated with offensive ordors in waterlogged soils. By the reduction of sulphates to sulphides ,and nitrates to nitrites, toxic compounds are also produced. Root suffocation under such conditions adds another link to a pathological chain of events, that makes the normal absorption of nutrients, impossible. In greenhouse benches, gravitational water is useful for its leaching effects when soluble salts become excessive, particularly after steam sterilization. Under such conditions, the liberal use of percolating water as a solvent to remove excess salts and toxic products, if present, is advisable.

Capillary water is coincident with the soil-solution that remains after drainage. It furnishes plants with most of their fluids; its energy relations are within physiological limits; it is a solvent for plant nutrients; it remains long enough to be biologically useful. The capillary movement and adjustment of soil solutions and their relationship to plant physiology are of vital importance. Capillarity accounts for soil water movements other than the downward movement due to gravity.

Soil structure presents an intricate labyrinth of heterogenous pores and spaces with ramifying tortuous communicating channels which produce a capillary system. When the soil particles are fine, a large area will be exposed in proportion to the spaces between them and the higher will the water rise. Small particles of soil are readily surrounded by a capillary film of water, but when the soil spaces are large, as when the soil is tilled, the film cannot surround coarse particles and there is a capillary break and loss of water by surface evaporation is greatly reduced.

Evaporation at the soil surface, attraction by dry soils and absorption of water by root hairs, thin the water films and increase their curvatures. This increases the negative pressure and water moves upward through the soil capillary system until the weight of the water lifted and the surface tension are at equilibrium. The height to which capillarity is effective varies with the composition and physical structure of the soil, and on the average will be only several feet.

Humus is produced by microbial decomposition of organic matter. It is not only an indispensable constituent because of its biochemical influences but is also a prime factor in improving soil structure. Because of its fragmentary character, it encourages granulation with crumbly soil formation, and by greatly increasing the soil porosity, adds to its capillary activity and water-holding ability. It also greatly increases the **ionic exchange** capacity, so vital in plant nutrition. In its microbial decay, it promotes hormone production as well as the formation of antibiotics, such as

penicillin, aureomycin, streptomycin, etc. These potent antibacterial products represent the most recent medical advancement in the treatment of certain types of infection and is also employed in the active and therapeutic treatment of conditions that previously had no effective chemotherapeutic agent. By the absorption of these germincidal substances, it is probable that plants develope a resistance or even an immunity against certain diseases. Good soil management should provide a continuous supply of organic matter, as many vital and physical factors as well as productivity, are controlled by its presence.

In heavy soils, the capillary system is finer and of good continuity, but water movement is sluggish in small channels, the adjustment is slow, and the amount delivered, is inadequate for optimum plant growth. In sandy soils, the capillary adjustment is rapid, but the presence of entrapped air and large pores cause so many capillary breaks, that the rise of moisture is limited. For optimum growth, an efficient capillary system must deliver a rapid flow of water in adequate volume. When capillary water is low, it is held at high energy levels and becomes unavailable.

(To be concluded in the May issue.)

CALENDAR OF EVENTS FOR APRIL AT THE GARDEN

1st	3 P.M.	Class— Desert Wild Flowers
2nd	3 P.M.	Lecture — Succulents Other than Cactus
7th	8 P.M.	Cactomaniacs — Mrs. O. Friedrichs will show slides of 'Guatemala'
8th	9:30 A.M.	Field trip to Cave Creek Dam and New River area.
9th	3 P.M.	Lecture — Arizona Cactus in Bloom
16th	3 P.M.	National Monuments in Arizona
19th	3 P.M.	Annual Meeting of the Board and Members
23rd	3 P.M.	Arizona Indians and flora on Reservations
30th	3 P.M.	Collecting plants in Mexico

SAGUARO LAND BULLETIN

DESERT BOTANICAL GARDEN of ARIZONA

MAY, 1959

Opuntia basilaris Eng. & Big
Beavertail prickly pear
An early blooming plant and
a favorite of our visitors

REG MANNING

SAGUAROLAND BULLETIN

Published and owned by the Arizona Cactus and Native Flora Society, sponsors of the Desert Botanical Garden of Arizona, P.O. Box 547, Tempe. Saguaroland Bulletin attempts to promote the Garden and to provide information on the desert plants and their culture. Subscription $5.00 per year, the subscription including active membership in the Society and the Desert Botanical Garden. Issued 10 times a year.

W. HUBERT EARLE, Editor

Volume 13 MAY, 1959 No. 5

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Garden open daily, including holidays, 9 A. M. to 5 P. M. from September 1st to July 1st

IN MEMORIAM

William Eliot, ex-city attorney, who had been our Chief Counsel for many years, passed away April 25th at the age of 64 years.

A man of solid integrity and having a prodigious memory, had been the guiding hand in facilitating the transfer of Papago Park to the City of Phoenix, thus ensuring the status of the Garden for years to come.

We regret his passing, but his unselfish hard work during the past years will stand as a monument to him for the future. —Ed.

THE DIFFERENCE BETWEEN CREOSOTEBUSH & GREASEWOOD

E. R. BLAKLEY
Grounds Superintendent, Santa Barbara Botanic Garden

In Arizona and Southern California the names creosotebush and greasewood are commonly misused. The name creosotebush refers to **Larrea tridentata,** a member of the Caltrop Family, and greasewood to **Sarcobatus vermiculatus,** a member of the Goosefoot Family.

It is very difficult to understand why these two names are so commonly misused, because the vegetative and floral parts of each plant are distinctly different. Both species growing under favorable conditions will reach a height of about eight feet. The average height of these plants is about four feet. Here all resemblance stops. In greasewood the leaves are alternate, narrow, entire, and fleshy. In cross sections leaves from plants in the northern part of its range are triangular, while the leaves from plants near the southern edge of the range are almost flat. The leaves of creosotebush occur as two leaflets, which are oblong to obovate, and united at the base. The flowers of greasewood are unisexual, the male flowers

Branch of Creosotebush — Larrea tridentata

occurring in catkinlike spikes, while the female flowers are enclosed in a perianth. They are white in color and not very showy. The creosotebush has yellow solitary flowers which may appear in April or May, or after any spring or summer rain. After a rain or when the leaves and small branches are crushed, the plant has a characteristic pungent odor. The fruit of the greasewood bush is a turbinate tube with a spreading winglike central portion. The fruit of the creosotebush is a dense wooly white five-celled capsule with a short persistent style.

sheep.

The creosotebush is found growing on dry plains and mesas, up to five thousand feet in elevation from western Texas, to southern Utah, Arizona, California, and northern Mexico. In many places the plant is found growing with burr sage, cactus, palo verde, and other kinds of desert vegetation. Creosotebush is not grazed to any extent by livestock and in some cases it is reported to be poisonous to them. The leaves and young branches produce a small amount of lac, which was used by the Indians of the Southwest for glue and water-

Branch of Greasewood — Sarcobatus vermiculatus

The two plants are not found living in the same type of environment. The greasewood bush usually lives in moist, saline soil, at an elevation of from one thousand to six thousand feet. It is distributed in North Amerca from North Dakota and Alberta, south to western Texas, New Mexico, Arizona, and California. Often it is found growing with Sueda and Atriplex in soil with a concentration of black alkali. The plant is a valuable browse especially in winter and spring when the young twigs and leaves are eaten by cattle and

proofing. This plant is the most drought enduring of all the desert vegetation. Its protoplasm is able to undergo a greater amount of desication than any other desert plant and still receive no permanent damage.

From this comparison it can be seen that there is almost no close relationship between the two different bushes. Therefore, if care is used in the application of the names greasewood and creosotebush, little confusion and misuse of these names should appear.

Leaves of Creosotebush

Leaves of Greasewood

BOOK REVIEW

Flowering Succulents — Gordon Rowley

Living Color Publications Limited, Farnham, Surrey, England:

Price 7/6

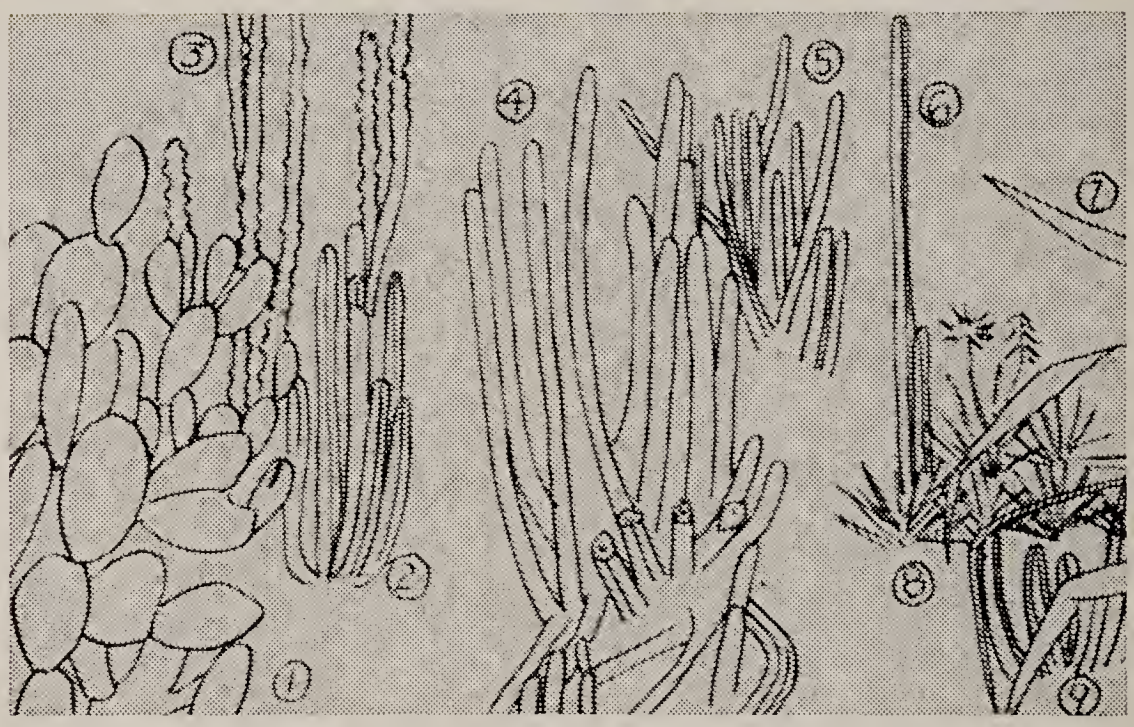
A compact 5x7 book that will fit into your pocket and can be profitably read while on train, plane, bus, or tram.

80 pages of 30 colored photos, 40 black & white photos and sketches of Cacti, Aloes, Stapeliads and Lithops.

Contains a wealth of 'down to earth' cultural material. Debunks many prevailing myths about succulent plants and illustrates several horticultural 'short-cuts' that could be used in this country.

A book that you will want to finish at one sitting so take a deep breath before enjoying it and becoming dedicated to raising Succulents.

ON THE GARDEN'S NATURE WALK



1. Prickly Pear (Opuntia ficus-indica), 2 — Mexican Organ Pipe (Lemaireocereus marginatus), 3 — Totem Pole (Lophocereus schottii var. obesa), 4 — Blue Organ Pipe (Lemaireocereus Pruinosus), 5 — Organ Pipe (Lemaireocerous Stellatus), 6 — Mexican Organ Pipe (Lemaireocereus marginatus), 7 — Leaves of the Dejected Century Plant (Agave decipiens), 8 — African Succulent Lily (Aloe cameronii), 9 — another Blue Organ Pipe (Lemaireocereus pruinosus)

CALABAZILLA

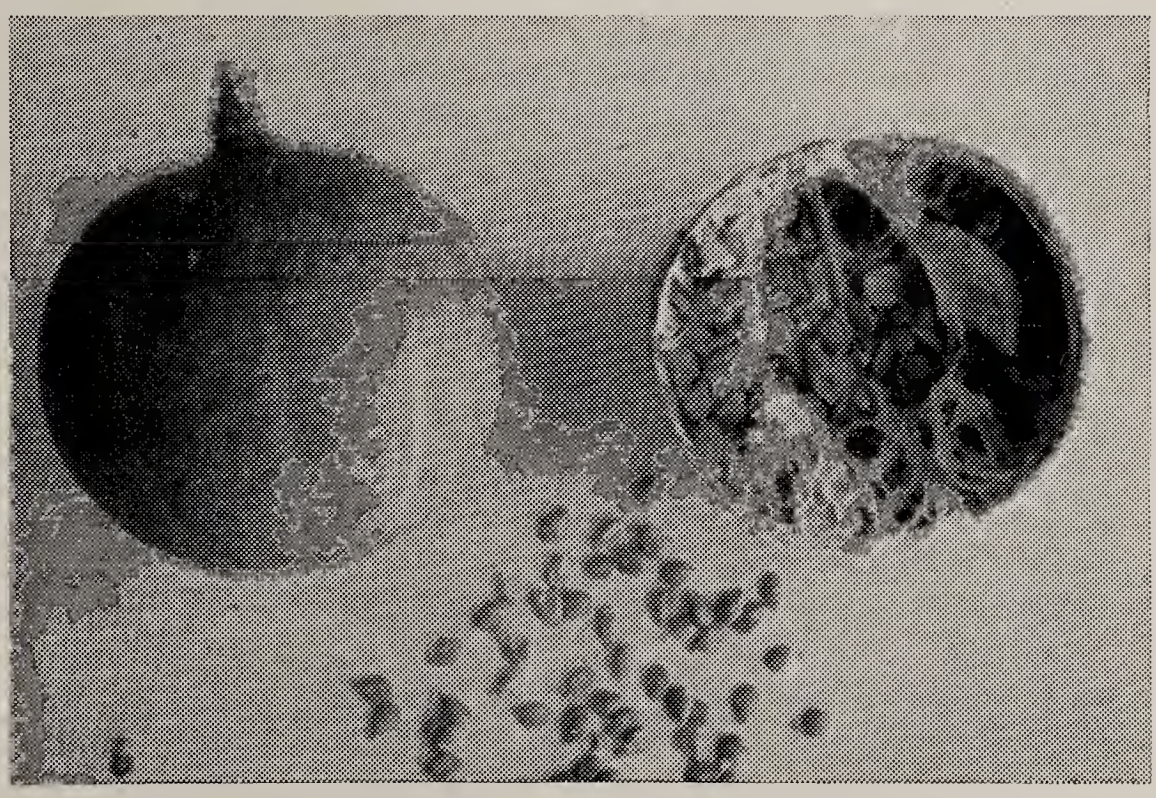
Cucurbita foetidissima H.B.K.

Chilicote
Chilicoyote
Chilicoyote
Cucurbitac
Chili-cojote
Chilicothe
Wild Gourd
Wild Squash
Missouri Gourd
Mock Orange
Gourd Family

Cucurbitaceae

The rank, garlicky odor of its crushed leaves probably suggested the appropriate Latin name given this plant. It is a coarse but decorative creeping vine, adorned with solitary yellow flowers that mimic the pumpkin's, and triangular, bluish-gray, velvety leaves that stand up in hot weather like so many trowels. It is able to survive in quite arid regions where shallow rooted plants perish; its roots often measure six feet. In the autumn, the gourds it produces are laid bare by the withered leaves, and resemble spilled oranges — which perhaps accounts for the popular name of "mock orange" given it in California.

Cucurbita is the Latin for gourd, but several of the Spanish names which are applied to the plant in Mexico and the United States, Southwest appear to be adaptions of the Aztec, or Nahua, chichicayotli.



Cucurbita foetidissima
Showing gourd-like fruit, seeds and interior of gourd.

Some portions of the calabazilla make a very strong purge; in fact, on overdose can be fatal. The gourd may be cleaned out, filled with water and drunk from after a short time. The resultant liquid is very bitter but most effective. The Tewa Indians grind the roots, stir them in cold water and drink the mixture as a laxative.

Chilicote also contains enough saponin to make it useful as a soap substitute. The fruit pulp is employed in cleaning and washing the hair, and to promote its growth an oil is extracted from the roasted seeds and applied to the scalp. Moreover, clothing is washed and bleached with it, but great care must be taken to rinse the garments well, or irritation of the skin may result when they are worn.

Many New Mexican housewives rub the cut surface of a gourd over a grease spot to remove it from wooden floors.

Two remedies for rheumatism are made from this plant. One is to bake the fruit in an oven, split it open, and rub it, while still hot, on the afflicted parts. And the other is to mix the ground roots with olive oil, aceite de comer, and apply. If a horse suffers from saddle sores, a decoction of the roots is supposed to give relief, and a small quantity in a bottle of water is a good cathartic.

A Santo Domingo Indian told me that he was never troubled with bedbugs, as the ground roots mixed with water and sprinkled all over the room banished them immediately. He also said that there is no reason to have a locoed horse or mule. "I can cure him easily by merely giving a mixture of two tablespoons of powdered calabazilla root, a few oats, a little bran, and a teaspoon of sulphur".

The early New Mexican women used the gourds as darning balls. And their children play a well-known game with the wild squash seeds. One holds a few them in his closed fist and another tries to guess the number. The command, Advinia, buen adivinador! — "guess, good guesser!" often is varied by the question Pares o nones? — "odd or even?"

I have been told the the Navajos come to Pena Blanca from the great Santo Domingo fiesta of August 4 to collect the fruit and carry them home to make rattles.

Ethnobotanical excerpt from 'Healing Herbs of the Upper Rio Grande' — L.S.M. Curtin, Laboratory of Anthropology, Santa Fe, N.M.

This plant is referred to as Buffalo-gourd and Coyote-melon in Arizona. As the plant has long trailing vines up to 20' long it could possibly make a good ground cover plant except for its ill-smelling character.

The Indian used to eat the gourds cooked, or dried for winter use, and crushed the seeds into a form of mush.

Gourds are decorated and hung as ornaments around dwellings. These were made by Mrs. Mary MacCallum in 1946 and are used continually.

Looking down on a group of Pachycereus pringlei and a few of our winter visitors.

WATER BALANCE IN SOILS

Dr. Louis E. Blanchard

(Continued from April)

Cacti and other plants that are adapted to desert conditions, will grow in a sluggish capillary water supply and are able to extract moisture held in the soil at high energy levels. As soil moisture is reduced by evaporation and plant activity, the remaining fluid is held with increasing tenacity. Humid region plants with high transpiratory losses of water, wilt and soon die under such conditions. Desert plants, by their ability to reduce transpiratory losses to a very low degree, compensate satisfactorily to this diminished water supply. MacDougal and Spalding have shown that the osmotic activity in the sap of succulents ranges from 5 to 12 atmospheres and that this pressure is doubled when their water-balance is depleted. High osmotic activity enables these plants to use soil water that is held close to the hygroscopic co-efficient.

Some soils, though flooded, may still present a dearth of available water. Such conditions are present in salt marshes where the water contains large amounts of dissolved salts. From a physiological point of view, this simulates arid conditions, and only certain plants known as **halophytes**, that have adapted themselves in a manner similar to **xerophytes**, can survive. The Mangrove Family of shrubs (Rhizophoraceae) have well adjusted themselves to saline and brackish habitats. These shrubs propped on many arching roots to protect themselves from high tides, are abundant in the coastal marshes in central and southern Florida. The dense evergreen growth of these mangrove shrubs (Rhizophora Mangle) with their leathery foliage, give the marshes a picturesque jungle appearance.

Soils that have been heat sterilized lose considerably in their water-holding capacity. In freshly steam sterilized soils in greenhouse benches, water will percolate as freely as in gravel. Some observers believe this condition is brought about by the coagulation of colloidal soil particles. Changing a fine texture soil into coarse particles with large pores, greatly reduces the capillary area and dimishes the water-holding capacity. This is only a temporary condition. Leaching to remove excess soluble salts and toxic products after sterilization, helps to correct this condition. In several weeks, the soil usually regains its normal capillary activity. During this period, more frequent watering is necessary than in non-sterilized soils.

The amount of water conducted in a soil by capillarity in a unit of time is of prime significance. Providing the physical structure is optimum for this conductance, the volume of capillary flow between two unit distances will depend on the difference in tension. The greater this **tension gradient,** the more rapid is the flow. In other words, the moisture adjustment between a wet and a dry soil will be rapid, but the adjustments between soils of low moisture content, will be sluggish. Water conductance is encouraged through a film of moisture in a damp soil. A very dry soil may stubbornly resist wetting because of entrapped air in large pore spaces.

Some greenhouse growers now use the constant water level benches to obtain maximum capillarity. Watertight shallow "V"-shaped benches are leveled with about one inch of gravel and a conductor channel placed in the "V." Soil of good physical quality is added to fill the bench. By the use of a reservoir and a float valve, the water is kept at a constant level in the gravel. With a

constant water table in proximity to the soil, there exists not only a high tension gradient for rapid delivery of water by capillarity, but the continuous supply keeps this moisture in low energy levels where it is easily available to plants. Under no condition, should the water level be in the soil as detrimental anerobic bacterial activity will result. Adjustments of water levels for optimum moisture should always be in the gravel zone. In our experience, vigorous growth of plants is produced in constant automatic water level benches. When soil tests indicate the need of fertilizers, these benches may be drained and no water applied for several days. A dilute liquid fertilizer may then be added to the surface by the hose and syphon method. This will not only furnish the nutrient requirements but will also wash down any excess soluble salts that may have accumulated at the soil surface. There are several other approved methods of automatic watering, such as injection for bench crops, perforated surface tubes, wicks and various types of sprinklers. Much credit is due to Professor Post (Cornell) for thes development of these systems. All these methods involve capillary conduction and maintain uniform moisture at low tension levels.

We use the Burnham-Lark soil tensiometers in our greenhouses. A porous porcelain cup and a vacuum gauge are connected with a tube. When the system is filled with water, and the porous cup is inserted in the soil, the vacuum gauge indicates the tension of the soil water. Each graduation (1 to 100) represents one hundredth (1/100) of an atmosphere of pressure, or 10 centimeters of water. Three of these capillary potential divisions corresponds to about one inch of mercury. In wet soils the pore space are-filled and the tension of the soil water is at atmospheric pressure and the gauge reading approaches a capillary potential of zero. As the soil dries, the increasing capillary tension produces a partial vacuum tension when the water is pulled out from the porcelain pores.

In our experience, the most vigorous growth is in the constant water level benches, when the soil tensiometer is at zero potential at the root region. At such favorably low tension, the roots absorb water with very little effort and wilting of plants never occurs even in the hottest summer days. With such adequate water delivery, no shading is necessary for many types of crops. In benches where surface water is applied by the hose method, we allow the tension to just start rising before watering again, as plants grow better when the soil is near its maximum capillary capacity.

Success with fertility is intimately associated with adequate water management, as available nutrients must be in solution to be of any value to plants. The acid reaction of soil-water due to the presence of carbon dioxide excreted by plant roots during respiration, and by the activities of soil bacteria and fungi, enhances its solvent power. Thus, soil-water in the form of dilute carbonic acid, will not only readily absorb all soluble material in the soil, but will act on insoluble particles to produce soluble salts.

Automatic types of watering have many advantages. They are labor-saving devices and deliver adequate water when the plants need it and there is no set-back from delayed or inadequate watering. Soil sanitation is good with uniform moisture. Porosity for aid and capillarity are easily maintained, as there is no compaction of the soil by surface watering. Foliage can be kept dry.

Regardless of the type of watering and whether in greenhouses or outside, the application should be of sufficient penetration to moisten the soil around the roots. Small amounts of water gravi-

tate a short distance before coming to an equilibrium. Losses by evaporation and root absorption, produce an adjustment to higher soil levels with an ever increasing tension of the remaining water. The deeper roots cannot grow or absorb moisture that is trapped by high energy forces. Frequent light watering is undesirable. Root tips are sensitive to soil-water variations and will grow in the direction of increased moisture. This response known as **hydrotropism,** produces an abundant root growth near the surface where root damage will quickly take place under dry conditions. When water is applied less often but freely, the roots will grow downward and deeper toward regions of greater moisture as it follows the descending **water-table.**

The roots of certain cacti (Echinocacti), while very extensive, grow close to the surface in desert regions. This enables these plants to capture the moisture of condensation from the air and frequently this is the only available water for long periods. Under certain conditions, soil **water-vapor** may supply available moisture. Water in a desert soil below the zone of capillary activity, will produce water-vapor. This vapor is under pressure which increases with the temperature. The sudden temperature drop that often occurs in deserts at night, will cool the surface areas rapidly. The water-vapor in the soil-atmosphere, rising from a deep warm zone to a cool surface area, will furnish additional moisture on condensation.

An understanding of the dynamic properties of water as a soil constituent and its behavior at various energy levels, are helpful in interpreting the plant responses to our water and soil management.

Summary

Water is an essential nutrient and general solvent. It is retained in the soil under varying dynamic forces in a complex capillary network. Certain portions of moisture are so tenaceously held that they have no biological significance; other portions under moderately high tension can only be used by desert plants through special adaptions. Peaty soils require an unusual amount of water as considerable moisture locked by high tension is unavailable to plants. Humid region plants attain optimum growth when ample water at low tension is continuously available. A favorable soil water-balance is only possible when soil structure is made porous with organic material. Humus is a dynamic indispensable soil constituent and should be continuously supplied as it is the controlling agent in the biochemical, physical and productive factors in good soil management.

CALENDAR OF EVENTS

5th 8 P.M. Cactomaniacs. An unusual group of slides will be shown by Mr. George F. Spaulding showing the country, flora and people of Rhodesia. DO NOT MISS THIS!

There will also be a good display of our night blooming Cerei.

9th 10 A.M. Arizona Academy of Science. Executive Board.

11th 7 P.M. Annual Official Board dinner and meeting.

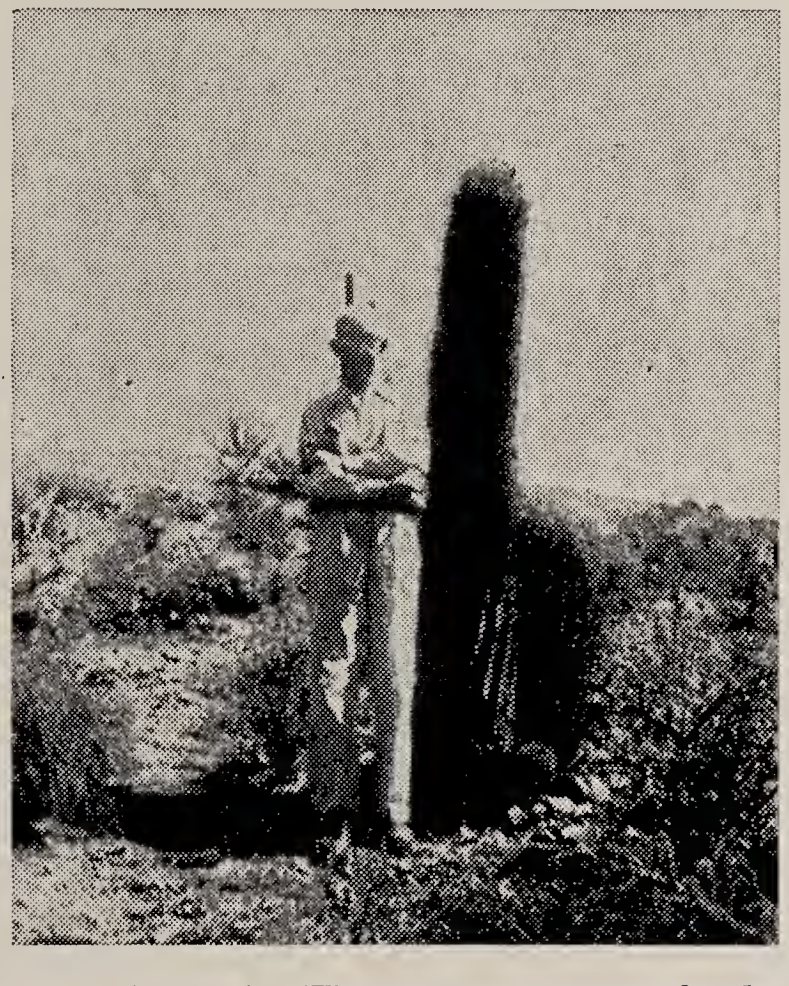
All classes and lectures will be resumed in November

Reserve July 8, 9, 10 for the 8th Cactus Convention in St. Louis

SAGUARO LAND BULLETIN

DESERT BOTANICAL GARDEN of ARIZONA

JUNE-JULY, 1959



A tall barrel (Ferocactus acanthodes) found growing in Papago Park dwarfs Mr. H. R. Ward who is 6' - 1"

REG MANNING

SAGUAROLAND BULLETIN

Published and owned by the Arizona Cactus and Native Flora Society, sponsors of the Desert Botanical Garden of Arizona, P.O. Box 547, Tempe. Saguaroland Bulletin attempts to promote the Garden and to provide information on the desert plants and their culture. Subscription $5.00 per year, the subscription including active membership in the Society and the Desert Botanical Garden. Issued 10 times a year.

W. HUBERT EARLE, Editor

Volume 13 JUNE-JULY, 1959 No. 6

Arizona Cactus and Native Flora Society

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Cactus & Succulent Society 71

Desert Botanical Garden of Arizona

STAFF

Director .....W. Hubert Earle
Consulting Botanist .....James A. McCleary, Ph. D.
Horticulturist .....John H. Weber
Assistant Horticulturist .....V. Edgar Jones
Student Horticulturist .....Demetrios Vlachos

Garden open daily, including holidays, 9 A. M. to 5 P. M. from September 1st to July 1st

Garden Closed July & August

FINANCIAL REPORT

INCOME		OPERATING EXPENSES	
Retail Sales	19,709.32	Purchases for Retail	12,503.35
Contributions	1,552.53	General Expenses	4,413.74
Memberships	2,252.50	Buildings & Improvements	2,900.30
Plants & Seeds	1,567.84	Utilities	1,265.35
($628.00 $939.84)		Insurance	669.53
Wholesale of Books	265.33	Salaries	14,090.57
Endowment Income	11,673.76	Auto Operation	675.85
Miscellaneous	588.83	Miscellaneous	672.17
	$37,610.11		$37,190.86

May 1, 1958 to April 30, 1959

ASSETS

Accounts Receivable		10.75
Inventory		
'Introduction to Desert Plants'		224.80
Merchandise for Resale		2,593.79
Deposit with Arizona Industrial Commission		96.00
Cash		
Valley National Bank (Checking)		8,222.94
1st Federal (Savings-Life Members)		630.20
Valley National Bank (Savings)		3,000.00
Petty Cash		20.00
Total Assets		$14,798.48

LIABILITIES

Reserve for State Withholding Tax	5.92
Net	$14,792.56

Gertrude Divine Webster Trust Fund
Valley National Bank—Trustee

1958-59 Control value	$217,630.95
1958-59 Market value	275,990.73
1958-59 Earnings	13,491.00

* * * *

Memberships	1957-58	475
	1958-59	540

1959 - 1960 BUDGET

INCOME		OPERATING EXPENSES	
Retail Sales	$21,500	Purchases for retail	$12,000
Contributions	1,500	General	2,800
Memberships	2,400	Buildings & Improvements	1,000
Plants & Seeds	2,000	Utilities	1,200
Wholesale of Books	1,000	Insurance	650
Endowment	11,500	Salaries	14,000
Miscellaneous	500	Auto Operation	600
	$40,400	Miscellaneous	600
		Research	2,000
			$34,850

BOARD MEETINGS

The annual election of members to the official Board was held April 18 and presided over by Vice Pres. John Rhuart. Mrs. Lou Ella Archer, Mrs. Angela Bool and Mr. Wm. Eliot were reelected to the Board.

On May 11th, the Annual meeting of the Board was held at the Sahara Hotel, presided over by Chairman John H. Eversole. Financial, budgets and other reports were given by members.

A research committee with Ed. Burrall, chairman, Mrs. Mildred May, Dr. James McCleary and your editor was appointed to study medicinal channels into which the Garden could offer its services.

The Board voted to transfer last year's income on sale of seed and plants plus $2,000 to the Savings account. Total in this account is now $6,567.84 which is being held for future Garden buildings.

ANTICIPATED ACTIVITIES FOR 1959-1960

May - Begin collecting of Cactus Seed
Re-aligned Morawitz path and add Bridge
Propagate seeds and plants

June - Assist Graduate Students of Desert Biology Course enrolled at ASU and sponsored by National Science Foundation
Construct cabinets, sales counter, pine-pole entrance and bridge railings and patio sales room for plants.
Increase capacity of car-port and enlarge beds in patio.

July - Paint kitchen, rooms, signs, etc.
Erect overhead lights at Auditorium entrances.
Erect low lamps along pathway to parking lot.
Attend 8th Biennial Convention of Cactus & Succulent Socitey St. Louis.

August - Black-top paths, oil parking lots and roads.

September - Open to the public

November - Fall Classes and Lectures commence.

February - 13th Annual Cactus Show

April - Classes and Lectures conclude on 27th and 28th.

* * * *

DID YOU KNOW — Attendance 1958-1959 was over 100,000 plus the following groups:

48	Grade School classes	1,530
14	High School Classes	606
24	College Classes	734
33	Girl Scout, Boy Scouts, Brownies etc.	492
3	Garden Clubs	95
14	Classes — Desert Plants	580
25	Thursday — Illustrated Lectures	1,025
8	Cactomaniac meetings	440
18	Lectures — away from Garden	1,215
5	Field trips	162
	Total	6,879

ON THE GARDEN'S NATURE WALK

1. — Honey Mesquite tree (Prosopis juliflora), 2.. — Organ Pipe (Lemaireocereus pruinosus), 3 — Urn-shaped century plant (Furcraea roezlii), 4 — Desert Spoon (Dasylirion wheeleri), 5 — Old Man of Mexico (Cephalocereus senilis), 6 — Palo Verde tree (Cercidium microphyllum), 7 — Chain Fruit Cholla (Opuntia fulgida var. mamillata), 8 — Coral Aloe (Aloe striata), 9 — Beaver-tail Prickly pear (Opuntia basilaris), 10 — Staghorn cholla (Opuntia spinosior), 11 — Chain fruit cholla (Opuntia fulgida), 12 — Candy barrel (Ferocactus acanthodes).

Layout sketch by John Weber

A DESERT GARDEN

A Desert Garden can be maintained in Central and Southern Arizona with a minimum amount of water and effort and rewarding its owner with many blossoms and surprises. It is paradoxical that so many persons building desert homes insist on maintaining a winter and sometimes a summer lawn thus using vast amounts of water, whereas a small portion of that water would sustain a large desert garden. Water is a scarce commodity and should be used to its best advantage.

Many persons, contemplating the building of a Desert Garden, feel that they can go anywhere on the desert and dig up plants, but, STATE LAWS prohibit the destroying, mutilating or removing of living plants from Public, State, Federal, National Parks and Indian lands.

Plants can only be removed from private lands by presenting to the Office of State Entomologist written permission from the owner of whose land you wish to remove plants 600 feet back from all roads. If this is allowed, a numbered permit will be issued to you for a $5 fee and you will have to remove the plants within 30 days. This procedure is to prevent the wanton destruction of desert plants, disregarding this law can cause the levying of heavy fines. If you have any questions about the plant law please contact the State Entomogist Office in the State Building.

You then ask "Where can I get some desert plants?" They can be obtained from friends, removed from the desert with a permit or visit your local nurseries who have been propagating desert plants for many years and have built up good stocks from which you can choose your plants. These nurseries will also plant and landscape your garden.

PREPARATION OF BEDS

If you are living on the desert there is very little you need to do to prepare the area for additional plants, but if you desire a garden in an area that is irrigated you must: 1st — elevate your bed 12 inches above the grass or irrigation with a border of irregular rocks, 2nd — remove all grass and its roots from the bottom of the bed. 3rd — fill bed with clean red decomposted granite to within 3 inches of the top of the rocks, as shown below.

The bed's surface can be left irregular, groupings of large rocks, gnarled tree branches or skeletonal chollas and Saguaros can be added.

A commercial fertilizer can be added to the plants the following year as new roots will then have been made by the moved plants.

SELECTION OF PLANTS

Border beds, open on both sides, should have low Cactus plants such as prickly-pears, barrels, pincushions and hedgehogs, also small Yuccas and Agaves (Century plants).

Wide border beds and those beds against walls or dwellings can use the above mentioned low plants plus Ocotillos, tall barrels, Saguaros, Yuccas, Joshua trees, small shrubs and desert trees.

Large open yards can be arranged using the above plants plus chollas, leaving lots of space between the plants. Add shrubs and desert trees. The area may seem barren for a year or two but will quickly 'fill-in'. An added attraction is the sowing of Wild Flower seeds that have to be protected from ants and birds and given additional water. The seeds can be purchased at nurseries or you can gather them yourself from the desert without breaking any plant laws.

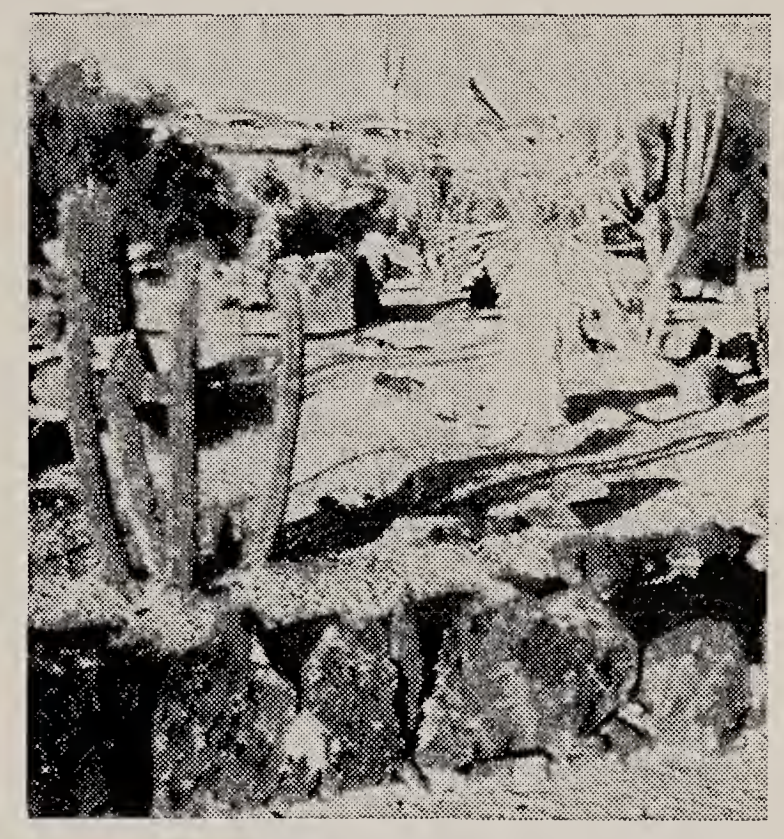
PLANTING AND WATERING

Before moving desert plants **MARK NORTH SIDE** of the plant and then plant that side to the **NORTH.** This will prevent you from planting the tender or shaded side of the plant to the hot sun thus causing the plant to sun-burn.

CACTUS: — Trim off broken roots with a sharp knife, dust the roots with powdered sulphur and let the succulent roots callous in a shaded area for a week, (Cactus will sunburn if left lying on the ground exposed to the hot sun. When the roots are healed, place the plant in the soil and mount the soil two inches up around the plant. In about a month this mound can be lowered and made into a 'well' to hold water given every other week. Do not water cactus during the cold months.

YUCCAS, CENTURY PLANTS, OCOTILLOS: — have fiberous roots which should be trimmed back beyond any breaks or bruises. Dust the roots with powdered sulphur to prevent infection. Plant at once, make a 'well' around the plant to hold water given once or twice a week.

DESERT TREES & SHRUBS: Ironwood, Mesquites, Palo Verdes, Desert Willow, Sweet Acacia, Creosote bush, Cassia and Hummingbird bush are all very good plants to use in your garden. They will grow fast, will withstand the aridity of our desert and bloom frequently. The desert shrubs and trees will not lend themselves to being transplanted from the desert so you will have to start them from seed or purchase them at the local nurseries growing in either one or five gallon containers.



Plant tree or shrub with most of its branches to the southwest for shading from the hot afternoon sun. Make a large "well" around plant and fill with water every other day for the first month, then twice a week until cool weather. Begin watering in the spring when the days begin to warm up or buds begin to appear on the plants. Trees should be supported and trained up redwood stakes for a few years.

DESERT WILDFLOWERS: many types do well in our desert gardens and will give you color for long periods. In the late fall the seed should be scattered on the ground or in the 'wells' of your other plants then racked into the soil and kept moist. Some brush or trash should be scattered over the seed to discourage the birds from eating the seedlings.

PEST AND RODENT CONTROL

Most of the desert plants are quite free from pests but the prickly pear and cholla cactus is often attacked by a Cochineal bug that builds a white cottony substance on the pads and stems, within this cotton is the red Cochineal from which a dye is obtained. This bug can be eliminated by two or three applications of Volk, an oily solution obtainable at nurseries. If you keep ants under control, your beds and gardens will be fairly free of many pests.

The greatest hazard to young growing plants in your desert gardens are the jack rabbits, cottontails, ground squirrels, pack rats and chuckwallas. One inch mesh poultry netting one or two feet high should be placed around young trees, shrubs and other plants. This will discourage the rodents until the plants are large enough to take care of themselves, then the wire can be removed. If you have serious rodent trouble contact the Rodent Division of the Arizona Fish and Game Department for advice.

PROPAGATION

CACTUS: — Additional plants can be obtained by cutting off pads of the Prickly pears and placing them on edge in the ground. Do not water for a month. Cuttings can be made from tall cactus by cutting off an arm or stem, dusting it with sulphur powder, let callous for a month and then place in sandy soil or pot. Do not water until new growth appears at the apex of the stem, then water lightly.

YUCCAS: — offsets can be sawed off plants then planted at once and kept moist. In the summer, encircle the leaves with a rope and then draw the leaves together. This will protect the new tender leaves.

AGAVES: — remove offsets from adult plant as they appear around plant. These offsets can be planted at once in the ground or in pots and kept moist.

OCOTILLOS: — stems can be sawed or trimmed off plant in the early spring. Set them into ground and keep moist. Many fences around desert ranches have been made in this manner.

TREES & SHRUBS: — gather or obtain seeds and start them in small paper drinking cups, keep moist, when seeds germinate and seedlings are a few inches tall then transfer slit cup to one gallon cans and water daily for a month and then about twice a week. Cans should be kept in a shaded area and plants allowed to grow for six to twelve months before transfering to your desert garden preferably in the spring.

The above article, by your editor, is to be published by the Valley Garden Cacti in their book "Practical Gardening in the Salt River Valley", late this season.

CANA AGRIA
CANAIGRE
CANAIGRA
WILD PIEPLANT
BUCKWHEAT FAMILY

Rumex hymenosepalus Torr.
Polygonaceae

Canaigre is particularly conspicuous during the latter part of the winter and early spring, because it retains its green foliage after surrounding plants have lost theirs.

The tubers resemble those of a sweet potato or dahlia, and contain a high percentage of tannin. Consequently, they have been used in the preparation of hides, but their slow growth practi-

Leaves and flowers of
Rumex hymenosepalus

cally prohibits any wide commercial extraction of the chemical.

Everyone has enjoyed Willa Cather"s "Death Comes for the Archbishop," and will probably remember the character of the adopted Indian boy. I have known the real Miguel very well for many years and have always admired his perseverence in earning a livelihood for himself and his family by gathering medicinal roots. Every autumn he takes a packtrain high up into the Sangre de Cristo range to the headwaters of the Pecos river, where he camps for weeks. After drying his harvest at home, it is sold to the people and pharmacies of Santa Fe.

During one of my visits with Miguel, I noticed some curious old wooden tools, highly polished by long usage. Never having seen anything like them before, I offered him an opportunity to explain them. He said they were his old tanning tools, and went on to tell me that the hides were soaked for half an hour in lime and water and then shaken to free them from hair. A bucketful of **cana agria** roots was added to one-half a barrel of luke-warm water, and the skins were left there for half a month. The barrel was tightly covered. At the expiration of the required time, the required time, the leather was removed, well-stretched, and "pegged-out" to dry for fiften days. After that it was ready for the final softening and use. Sometimes **pino real colorado** (literally, royal red pine) was substituted for **cana agria.**

Another method, he continued, was to soak deer and goat pelts for three days

Tuber-like Root of Rumex
hymenosepalus

Flowers of Rumex hymenosepalus

in water. A skin is removed and the head is hung up on the top of a log which stands upright, and a knife which has been inserted in a curved stick is used to scrape off the hair. The hide is placed in a little water to which boiled brains have been added. These are worked into the hide until the mixture has been absorbed. The skin is suspended overnight to dry and soaked in water the following morning until soft. Then, it is wrung out with a stick until the hide turns black, and the leather is manipulated for half a day, making it soft and ready for use.

In olden times, cow and horse hides, but no burro skins, were made into sole leather, and the two-year-old calves' hides into the uppers on lace boots and low shoes with buckles. The shoemakers used wooden lasts and the shoes were pegged with wood. Local tailors fashioned their coats and trousers from deer skin, goat leather, and the hides of castrated kids. Whenever fastenings were necessary, wooden buttons served this purpose.

The **canaigre** roots also furnished the basis of several local remedies. Perhaps the resourceful person who conceived that well-known advertising slogan, "four out of every five have it," never heard that ground wild pieplant is used as a rinse for pyorrhea. **Canaigre** tea often is employed as a gargle for sore throats and the powder is applied under the arms and the legs to reduce skin irritations.

Ethnobotanical excerpt from 'Healing Herbs of the Upper Rio Grande' — L. S. M. Curtin, Laboratory of Anthropology, Santa Fe, N. M.

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* Canaigre, wild-rhubarb. The high tannin content has aroused interest in canaigre but attempts to cultivate the plant have not been financially successful hitherto. The United States Dept. of Agriculture is conducting experiments to this end. The Petioles make a good substitute for rhubarb in pies. Indians and Mexicans use the leaves of this and other species of **Rumex** for greens and eat the petioles roasted or stewed with sugar. As with other greens that are sufficiently succulent, the Papago Indians roast rather than boil canaigre leaves, probably because of the frequent scarcity of water. The Hopi and Papago Indians used the roots for treating colds and sore throats and a dye was formerly obtained from them by the Navajos.

* Flowering Plants and Ferns of Arizona-Kearney & Peebles.

PROGRAM

EIGHTH BI-ENNIAL CONVENTION
OF THE
CACTUS & SUCCULENT SOCIETY OF AMERICA, INC.

ST. LOUIS, MISSOURI — JULY 8th to 11th, 1959

HOST SOCIETY
Henry Shaw Cactus Society

WEDNESDAY, JULY 8, 1959

9:00 A.M. Registration at Meeting Hall, Holiday Inn.

10:00 A.M. Opening of the Convention. Ladislaus Cutak, Convention Chairman, Presiding.
Invocation, Rev. Glennon Goellner, Assistant Pastor of Pope St. Pius the Fifth Church.
Address of Welcome, Dr. Frits W. Went, Director, Missouri Botanical Garden.
Response, Harry Johnson, President, Cactus and Succulent Society of America, Inc.
Royal Greetings, Kings and Queens of Past Conventions.
Introductions.

12:00 Noon Group Luncheon. Meeting Hall, Holiday Inn.

2:00 P.M. Convention Sessions, Harry Johnson, President, Cactus & Succulent Society of America, Presiding.
Meeting of Delegates.

3:00 P.M. Address, Illustrated, Dr. Norman Boke, University of Oklahoma, Norman, Oklahoma, "A Morphologist Looks at the Cacti".

6:00 P.M. Group Dinner. Meeting Hall, Holiday Inn.

7:30 P.M. Convention Session, Harry Johnson, Presiding.
Election of King and Queen.

8:00 P.M. Address, Illustrated, Ladislaus Cutak, Missouri Botanical Garden, St. Louis, Mo. "See Missouri's Attractions" and "Cacti for Home and Garden".

THURSDAY, JULY 9, 1959

10:00 A.M. Convention Session, President Harry Johnson, King and Queen Presiding.
"Questions and Answers" W. Hubert Earle, Harry Johnson, John Rogers.

12:00 Noon Group Luncheon. Meeting Hall Holiday Inn.

2:00 P.M. Convention Session, W. Hubert Earle, Director, Desert Botanical Garden, and King and Queen, Presiding.
Address, Illustrated, Patricia & Chester Moorten, Palm Springs, California. "Mexico".

3:00 P.M. Address, Illustrated, Dr. Edward F. Anderson, Pomona College. "Peyote and Peyotism".

6:00 P.M. Group Dinner. Meeting Hall, Holiday Inn.

7:30 P.M. Convention Session, Dr. Norman Boke, University of Oklahoma, Presiding.
Address, Illustrated, Dr. Frits W. Went, Missouri Botanical Garden, St. Louis, "Physiology of Desert Annuals".

8:30 P.M. Address, Illustrated, W. Hubert Earle, Desert Botanical Garden, Phoenix, Arizona, "The Desert Botanical Garden".

FRIDAY, JULY 10, 1959

10:00 A.M. Convention Session, Ladislaus Cutak, King and Queen, Presiding.
Colored Slides: Past Conventions.
Colored Slides: Favorite Cactus or Succulent.

12:00 Noon Group Luncheon. Meeting Hall, Holiday Inn.

200 P.M. Convention Session, Harry Johnson, King and Queen, Presiding.
Address, Illustrated, George Glade, Society Board Member, Past President Los Angeles Cactus and Succulent Society.
"Aloes of South Africa".

3:00 P.M. Address, Illustrated, Ladislaus Cutak, Commentator.
"Exotic Collection of Edgar and Brian Lamb — England".

6:00 P.M. Group Dinner. Closing Banquet. Informal.

7:30 P.M. Fun Session, Patricia Moorten, Palm Springs, California, Presiding.
Hat Contest.
Costume Contest.
Initiation into Ancient Order of Cactus Nuts.
Address of Farewell.
Closing of the Convention.

SATURDAY, JULY 11, 1959

9:00 A.M. Assemble for Post Convention Trip to Missouri Botanical Garden.

9:30 A.M. Leave by bus, arriving at Missouri Botanical Garden around 10:30 A.M. Leisurely visit to Mammoth Cactus Show in Flower House.

12:00 Noon Luncheon at Shaw Methodist Church, Tower Grove and Shaw, (Just across from Shaw's Garden.)

1:00 P.M. Return to Shaw's Garden. Tour of Henry Shaw Old Home, built in 1849. Tour of Grounds. Tour of National Council of State Garden Clubs new home, where punch will be served.

3:00 P.M. Leave Shaw's Garden for Holiday Inn, arriving around 4:00 P.M.

5:00 P.M. Assemble for Trip to Forest Park, arriving at the Muny Opera around 6:00 P.M.

6:30 P.M. "Meet the Cast Party" at Muny Opera. Guided tour of mammoth stage. Visit with cast. Supper Box Lunch on Rehearsal Stage.

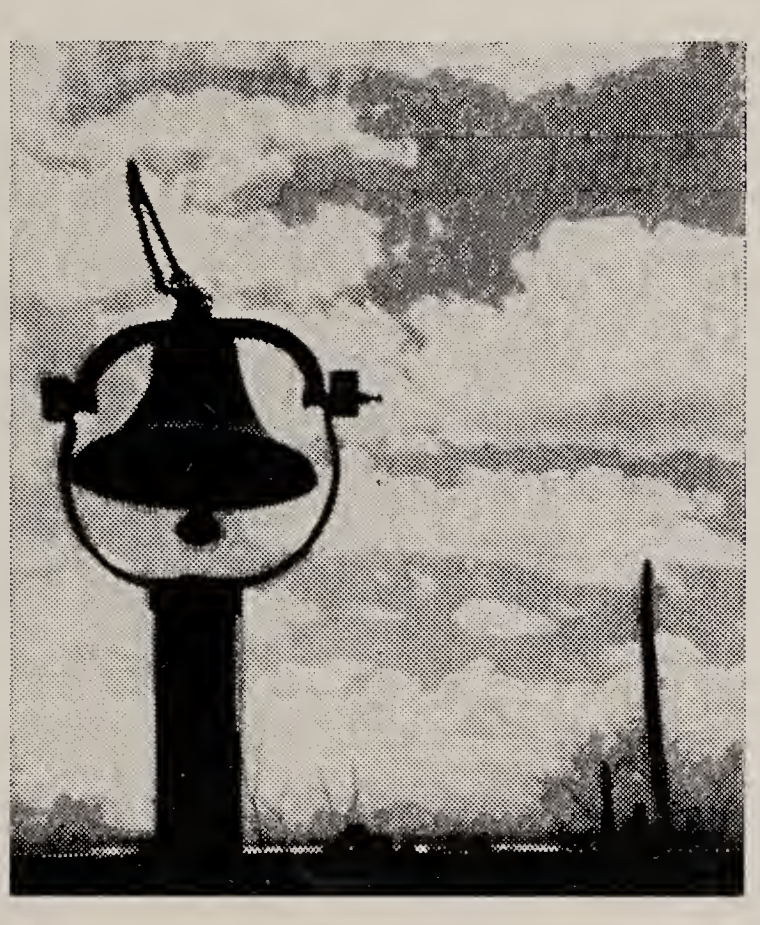
8:15 P.M. Regular Performance of "Rio Rita" starring Peggy Bonini, Stephen Douglass and an all-star cast.

11:00 P.M. Leave by bus for Holiday Inn ,arriving around Midnight.

SAGUARO LAND BULLETIN

DESERT BOTANICAL GARDEN of ARIZONA

AUGUST-SEPTEMBER, 1959



This familiar old Mission bell, located at the entrance to the Webster Auditorium, will soon be ringing again when the Garden reopens to the public Sept. 1st.

REG MANNING

SAGUAROLAND BULLETIN

Published and owned by the Arizona Cactus and Native Flora Society, sponsors of the Desert Botanical Garden of Arizona, P.O. Box 547, Tempe. Saguaroland Bulletin attempts to promote the Garden and to provide information on the desert plants and their culture. Subscription $5.00 per year, the subscription including active membership in the Society and the Desert Botanical Garden. Issued 10 times a year.

W. HUBERT EARLE, Editor

Volume 13 AUGUST-SEPTEMBER, 1959 No. 7

Arizona Cactus and Native Flora Society

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Desert Botanical Garden of Arizona

STAFF

Director ..... W. Hubert Earle
Consulting Botanist ..... James A. McCleary, Ph. D.
Horticulturist ..... John H. Weber
Assistant Horticulturist ..... V. Edgar Jones
Student Horticulturist ..... Demetrios Vlachos

Garden open daily, including holidays, 9 A. M. to 5 P. M. from September 1st to July 1st

Garden Closed July & August

CANUTILLO DEL CAMPO

POPOTILLO
TEPOPOTE
ANATILLA
MORMON TEA
TEAMSTER'S TEA
BRIGHAM YOUNG WEED
DESERT TEA
SQUAW TEA

EPHEDRA TORREYANA S. WATS

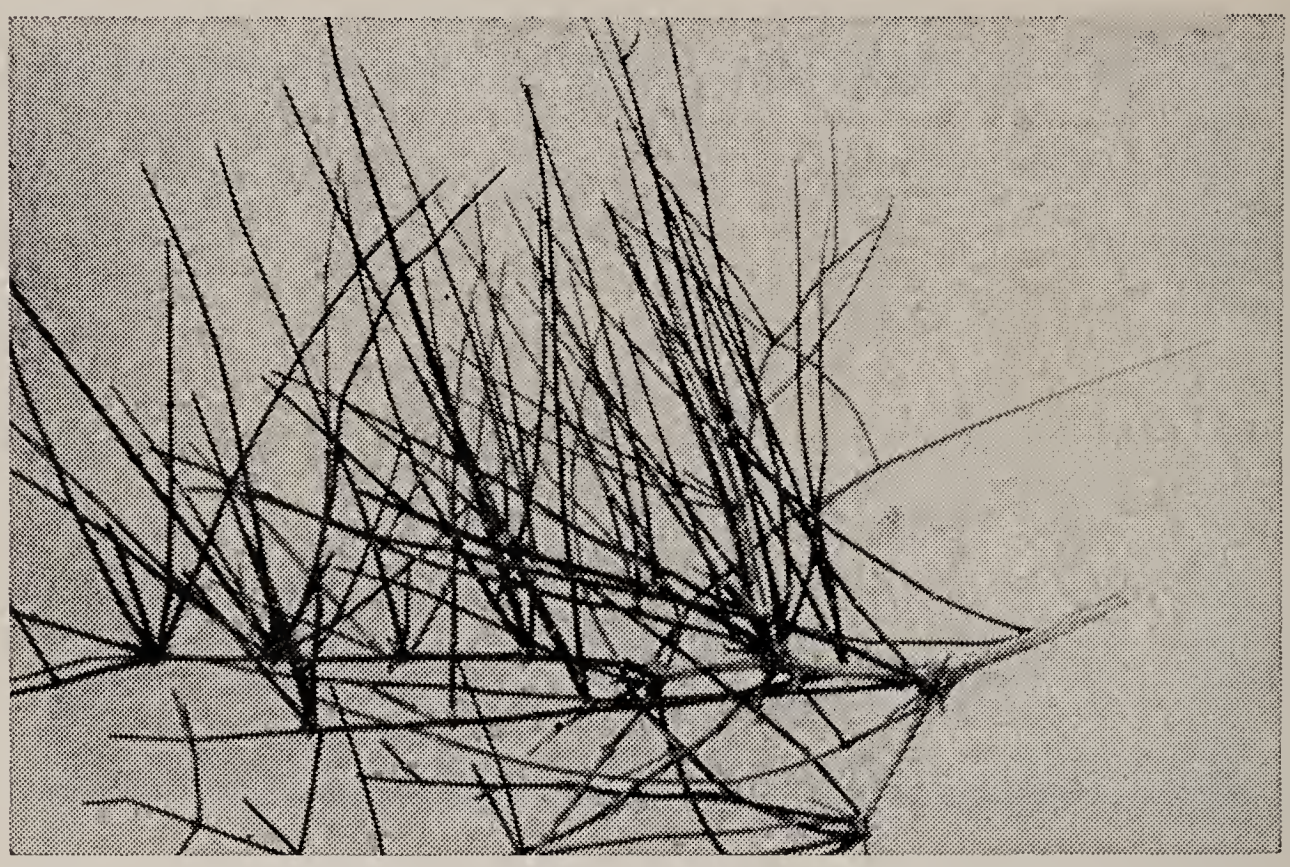
JOINT FIR FAMILY

EPHEDRACEAE

Ephedra Nevadensis. A large bush of about 5' tall and 8' in diameter growing at the Garden.

Broad, thin leaves permit a great deal of evaporation of moisture, and since desert plants cannot permit such an extravagance, many of them have very small leaves or none at all. In this latter class we find Ephedra, a shrubby plant so well adapted to its dry environment that it often dominates large areas. It occurs in several species, but it may always be recognized by its numerous and many-jointed tubular twigs and its brownish to yellow-green color.

There is a suspicion, held by certain botanists in the United States, that our Southwestern knowledge of Ephedra's peculiar properties may be due to Mexican trade contact with the Chinese before the United States were formed. It is a definite matter of record that the Chinese doctors have employed an Asiatic species of Ephedra (Ephedra sinica) for more than twenty centuries. They call it 'ma-huang', and prescribe it for headaches, colds, fevers, and skin eruptions. Members of our medical profession have been interested in trying to find some American ephedrine comparable with that of China. But, as yet, none of the shrubs in California, Nevada or Arizona has yielded satisfactorily the alkaloid which is the active principle. Anglos of the Southwest have taken quantities of canutillo tea in the hope of dissipating rheumatic and arthritic pains.



Ephedra nevadensis. Showing the thin leafless stems and the prominent joints. At these points the stems can easily be disjointed. Thus the name —Joint Fir.

The native species, however, are liberally provided with tannin, and the number of vernacular names which have been given this plant are proof of the reliance desert people, both Red and White, have placed upon its remedial properties. It was adopted by White explorers and frontiersmen as a medicinal drink supposed to act as a blood purifier, and during the early days in California it was regarded highly as a remedy for renal and vescile disorders. Among these people, also, it was not uncommon as an equivalent, at meals, to tea or coffee; and the Navajos value it as a beverage when they have first prepared the stems by roasting them in their camp fires. The Mescalero Indians take a decoction of the entire plant as an antiblenorrhagic, and the Pimas drank a decoction of its stems as an antiluetic.

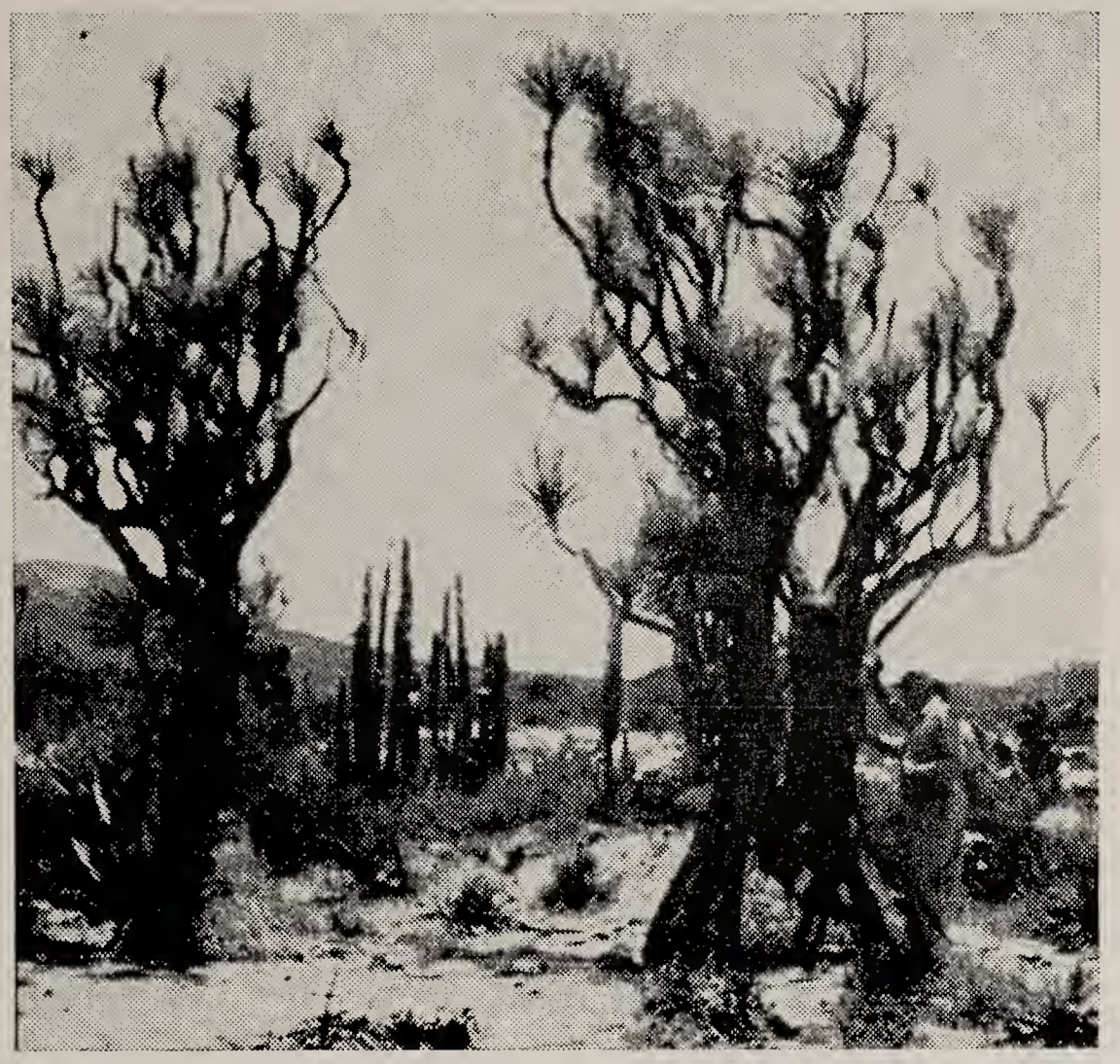
Mary Austin states that because of its activating properties on the mucus membrane, the desert tribes of California, on making long journeys with insufficient water, will chew the stems, and they prescribe a tea made of it as a precaution against thirst.

In New Mexico, as in several states, it has been used in counteracting the so-called "French disease". Here, a big handful of the plant boiled in a quart of water, strained through a cloth, and a glass of the hot liquid taken three times a day an hour before meals is supposed to clear the system of any venereal disease. When the suffering has been alleviated, one must eat a chopped red onion thrice daily, before meals, for six or eight days.

A decoction of the plant is drunk several times a day to reduce fever and to relieve pain in the kidneys. As a diuretic it is boiled in water, and allowed to cool out-of-doors over-night. Then a glass is taken every morning as long as necessary.

Ethnobotanical excerpt from 'Healing Herbs of the Upper Rio Grande' — L. S. M. Curtin, Laboratory of Anthropology, Santa Fe, N. M.

TREE LILIES



Mr. Chas. Mieg and Andre Cuenoud of Scottsdale, examining the alligator-like bark of a 900 year old Beaucarnea gracilis

Mexico has many curious trees and shrubs but the most unusual belong to the Liliaceae (Lily Family). Some of these have heavy, swollen trunks- Beaucarnea; some have simple trunks with narrow, wide, stiff, sharp leaves — Yucca (Spanish dagger); others have long thin flower stocks, 4' to 6' long — Hesperaloe (Red Yucca); another has a puff-ball base with small roots — Calibanus; another has long narrow leaves who's edges are covered with saw-like prickles — Dasylirion (Desert-spoon) and the other has thin grass-like leaves — Nolina (Bear-grass).

The above six genera are found well distributed throughout Mexico and are very useful in supplying leaves for weaving of mats, hats, baskets and the making of brooms and cordage. The trunks of many of these can be roasted in a pit and then eaten. During dry periods the trunks are split open so that cattle can forage on the inside material. The roots of several of the genera contain amole which is used for the washing of clothes and the hair.

Beaucarnea gracilis	Lemaire	1861
Beaucarnea oedipus	Rose	1906
Dasylirion gracile	MacBride	1918

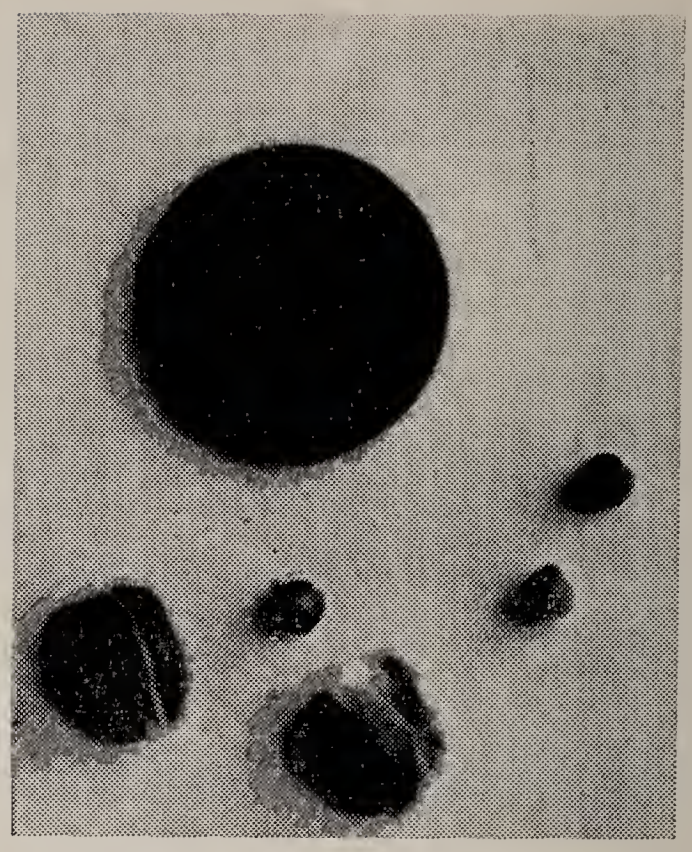
In July, 1958, a trip was made by Mr. Chas. Mieg, Andre Cuenoud and your editor to Tehuacan, Pueblo, to collect seeds and plants of the above species. We were fortunate in finding seeds that were ripe and were able to photograph the plants. Small plants were very hard to locate as their grass-like leaves blended with the surrounding grass but after an hour of searching we finally found several 2" plants that have now established themselves in the collector's Arizona gardens.

A wind-swept B. gracilis near Tehuacan, Mexico.

Beaucarnea recurvata Lemaire 1861
Beaucarnea tuberculata Rosel 1883
Nolina recurvata Hemsley 1884
Dasylirion recurvatum MacBride 1918

This is a tall Beaucarnea with recurved leaves found growing in the tropical and semi-tropical areas of Mexico. It is the fastest growing of all the Beaucarneas and is used extensively as a potted plant but must be kept away from chilling winds and needs humidity.

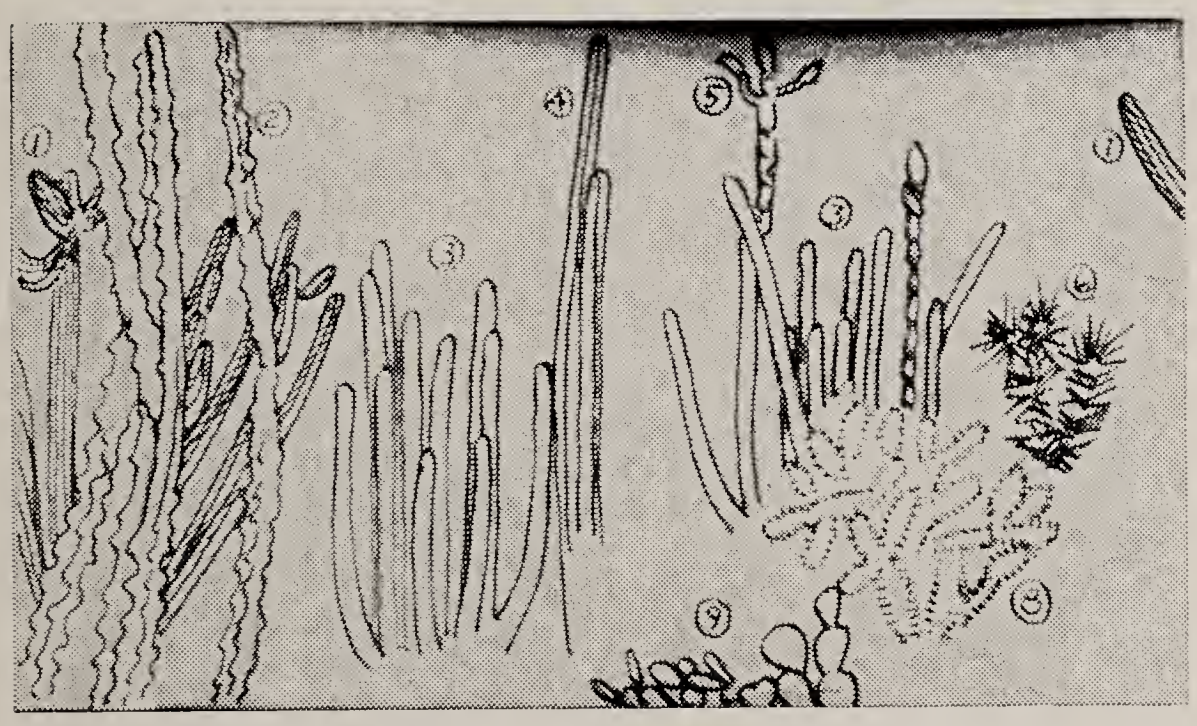
It has a smooth trunk and we first noted it growing amongst the tropical trees along the mountain sides just a few miles west of Ciudad de Valles, San Louis Potosi State. Beaucarnea inermis is also found growing in this area but its leaves are much shorter than those of B. recurvata.



Fruit and seels of B. gracilis.

We have been successful in germinating seeds of B. gracilis and in about ten years hope to have plants about 5" tall. The seedlings and transplanted plants all do very well if grown in decomposed granite with sparse waterings.

A one year old seedling of B. gracilis.

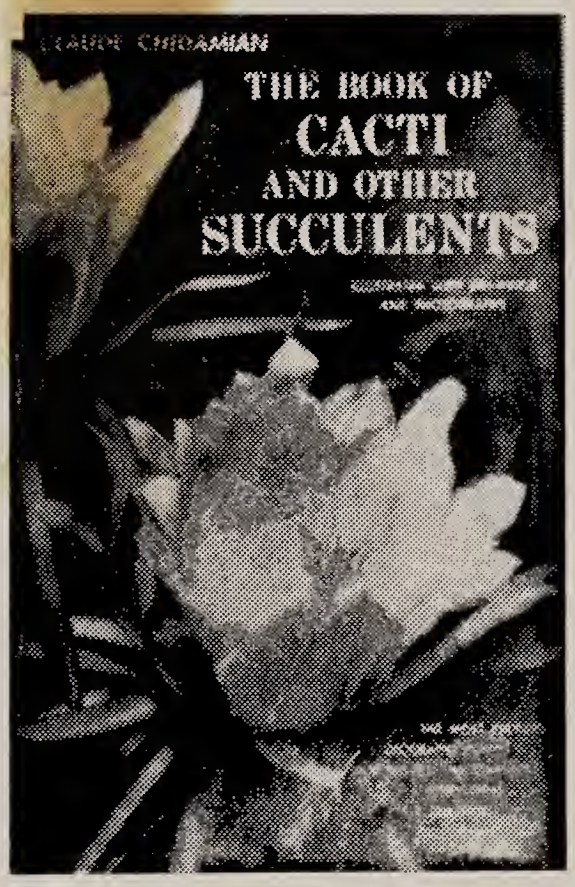


1—Organ Pipe (Lemaireocereus pruinosus, 2—Totem-pole (Lophocereus schottii forma monstrosus), 3—Organ-Pipe Lemaireocereus stellatus), 4—Mexican Organ Pipe (Lemaireocereus marginatus), 5—Flowering bud of a Century plant (Agave orcuttii), 6—Joshua tree (Yucca brevifolia), 7—Organ Pipe (Lemaireocereus stellatus), 8—Spiny cholla (Opuntia fulgida), 9—Rabbit-ear prickly pear (Opuntia microdasys)

BOOK REVIEW

The Book of Cacti and Other Succulents

Claude Chidamian. The American Garden Guild and Doubleday & Company, Inc., 575 Madison Avenue, New York 22, New York. 1958. 243 pages, 22 pages of drawings, 14 pages of halftones, 2 pages of color illustrations. $4.50. (Library).



A one-volume guide that is very appealing and comprehensive, enough so, that anyone wavering as to whether to grow succulents or not, would plunge into the project with the able aid of this book on a 'do-it-yourself' basis and achieve success.

This is a well printed book with clear comparative line-drawings by Shirlea Hatcher. She has captured the necessary detail in the various plants which make the drawings quite refreshing and eye-catching.

This popular reading book explains the development of succulents (Cactus and other Succulents) from the beginning to the present time. Care is taken not to use too many scientific names and phrases thus lending an informative yet not boring detail to the layman and beginner.

The pronunciation 'break-down,' as shown after the generic names, will appeal to the many persons who wish to know the correct pronunciation of the various genera.

The section on cultivation is rather sketchy but good. It is a hard subject to cover thoroughly due to the climate extremes of our continent. "How to Pot Succulents," Page 141, is a 'must' and the bold type of "DO NOT WATER AFTER PLANTING. Wait a week or two for roots to become established" should be observed by all growers of succulents. Too many succulents are lost due to premature watering before injured or trimmed roots are healed or new roots begin to develop.

This fine book gives you many good suggestions on how to grow your plants in either an indoor or outdoor garden and also how to make them blossom and what controls to use to rid your garden and plants of insect pests.

Every year new books are published about plants and it is delightful to find one, such as this book, that is easy to read and assimilate and also gives you the desire and encouragement to either begin growing succulents or to improve your own plantings.

Credit is due this author, horticulturist, and lecturer who for many years has spoken to garden clubs, civic organizations and nurserymen along the Pacific Coast to further the use of the proper plants in their plantings.

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* This review was written by your Editor for the National Horticultural Magazine, April 1959.

A few of the books that we have acquired this year for our Library. Many of our members and botanists avail themselves of the opportunity to use our large library devoted to desert plants.

The 8th Biennial Convention was quite a success with over 135 persons registered. This is one third of a group picture of about 85 cactus fanciers. The remainder were enjoying sights of St. Louis. Kneeling — Chas. Cole, Cincinnati. Seated — Richard Barad and David Barad, New York City; Mrs. Margaret Delporte, St. Louis; Mrs. Marie Grunewald and Walter Grunewald, Hiawatha, Iowa; Standing — Edward Nadolny, Albuquerque, N.M.; Chester Moorten, Palm Springs, Calif.; Lad Cutak, St. Louis; Fred A. Eisele, Webster Groves, Mo.; Nickol Glaviano, Palatine, Ill.; Ed. Vogelsang, Overland, Mo.; Mrs. Mildred Cole, Cincinnati; Mort Speilman, Chicago; Dudley Gold, Mexico City; Dr. Gerald Barad, New York City; Mrs. Alicia Gold, Mexico City; Lee Smith, Downers Grove, Ill.; Mrs. Janet Smith, Downers Grove, Ill.; Carl B. Snyder, Overland, Mo.; Paul Shaw, Kennett Square, Pa. and Mrs. Ludy Ballack, St. Louis. Continued to page 83

Seated, left to right: Mr. and Mrs. Hubert Earle, Tempe, Ariz.; Dr. Helia Bravo, Mexico City; Mrs. Libbie Fischer, St. Louis; Rytie Hoff, McFarland, Calif.; Miss Schneckenberger, Kenner, La.; Mrs. Grace Bennitt, Bakersfield, Calif.; Mrs. Emma Gruenewald, St. Louis; Mrs. Elizabeth Haldenwanger, St. Louis; Kathleen Marzullo, Chicago; Standing (Women) — Mrs. Lydia Cutak, St. Louis; Mrs. Lottie Vogelsang; Mrs. Ed. Miller, N.Y.C.; Mrs. Myrtle Speilman, Chicago; Mrs. Gladys Matesick, St. Louis; Mrs. Leopoldine Stampehl, Brentwood, Mo.; Mrs. Doretta Wiekhorst, Webster Grove, Mo.; Miss Wava Frye, Detroit; Mrs. Delia Ayers, St. Louis; Mary Ellen Van Syckle, Detroit; Miss I. Schneckenberger, Kenner, La.; Miss Carrie Schneckenberger, Kenner, La.; Mrs. John A. Bock, Sharon, Pa.; Miss K. Schneckenberger, Kenner, La.; Mrs. Irving Bates, N.Y.C. (Men) — Mr. Ed Miller, N.Y.C.; William Fischer, St. Louis; Luke Vortman, Albuquerque, N.M.; Ben Haines, Topeka, Kan.; C. E. Fecht, St. Louis; John A. Bock, Sharon, Pa.; Irving Bates, N.Y.C., Nick Bokarica, Los Angeles.

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Seated, left to right — Mrs. Ruth Stanton, Lawndale, Calif.; Mrs. Margaret Radden, Chicago; Mrs. Helen Phillips, McFarland, Calif.; Harry Johnson, Paramount, Calif.; Miss Vera Rose, Bryn Athyn, Pa.; Mrs. Mollie Loebner, Overland, Mo.; Standing — (Women) — Mrs. Monica Vetter, St. Louis; Mrs. Ella Nipper, Chester, Ill.; Mrs. Zetta London, East St. Louis; Mrs. Arthur Covey, Harwinton, Conn.; Mrs. Irma Huch, Chester, Ill.; ?; Mrs. Erwin Henke, Kalamazoo, Mich.; ?; Mrs. Mary Anderson, Royersford, Pa.; Mrs. Ed Nadolny, Albuquerque, N.M.; Mrs. E. J. Koons; Mrs. Olive B. Wells, Bryn Athyn, Pa.; Mrs. E. J. Hester; Mrs. Kay Beattie, Torrance, Calif.; Mrs. Anna K. Sherman, Albuquerque; (Men) — Donald Podolski, Chicago; Jimmy New, Delta, Ala.; George Stritikus, Birmingham, Ala.; H. J. Koons; Arthur B. Wells, Bryn Athyn, Pa.; E. J. Hester; Erwin Kenke, Kalamazoo, Mich.

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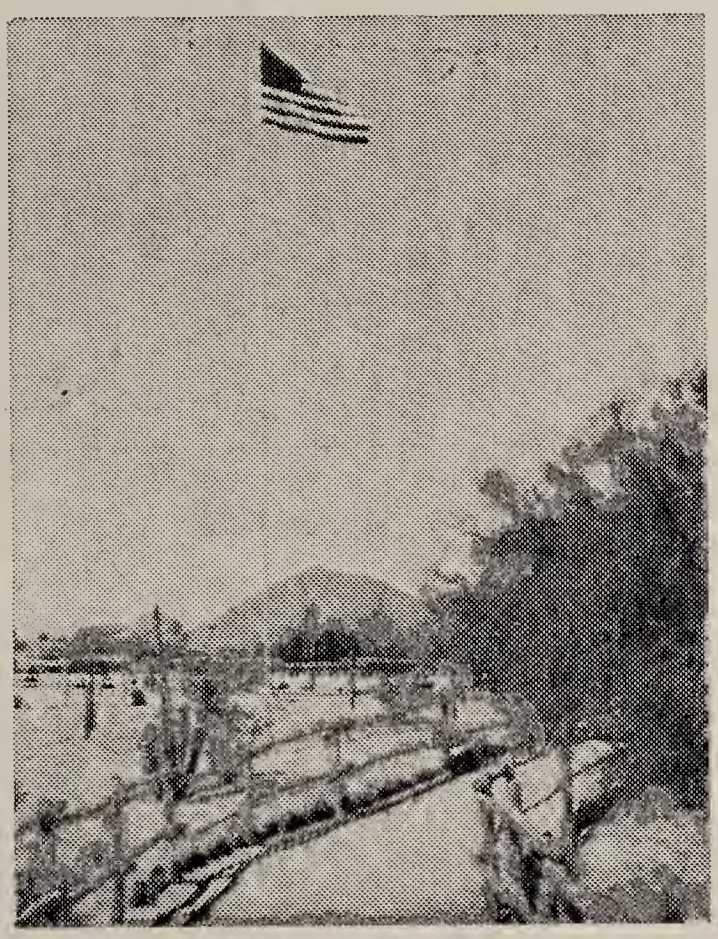

A flag pole was erected at main entrance this summer. Note the new peeled pine pole posts and rails that help to keep our visitors on the paths.

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Photos of Japanese gardens by Kochi Mizuno

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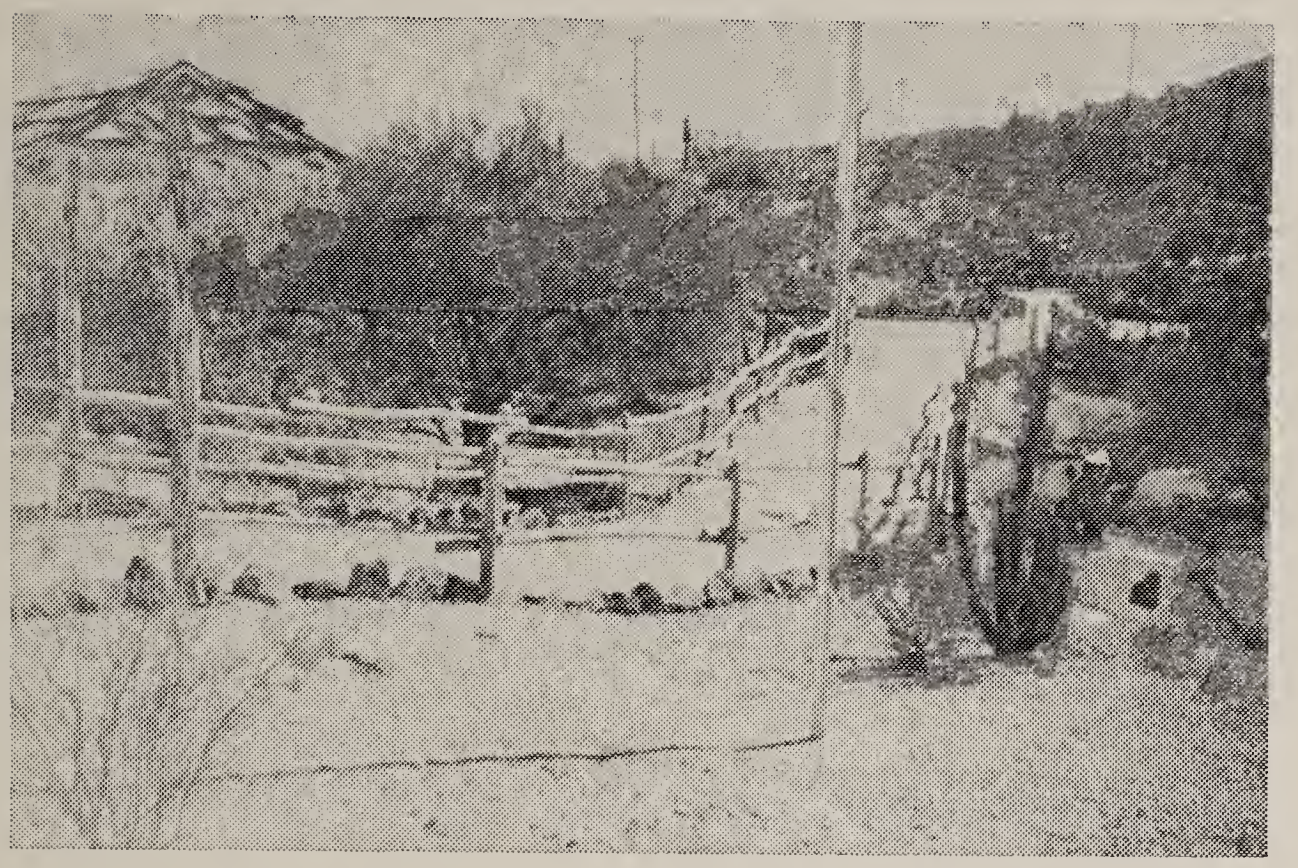
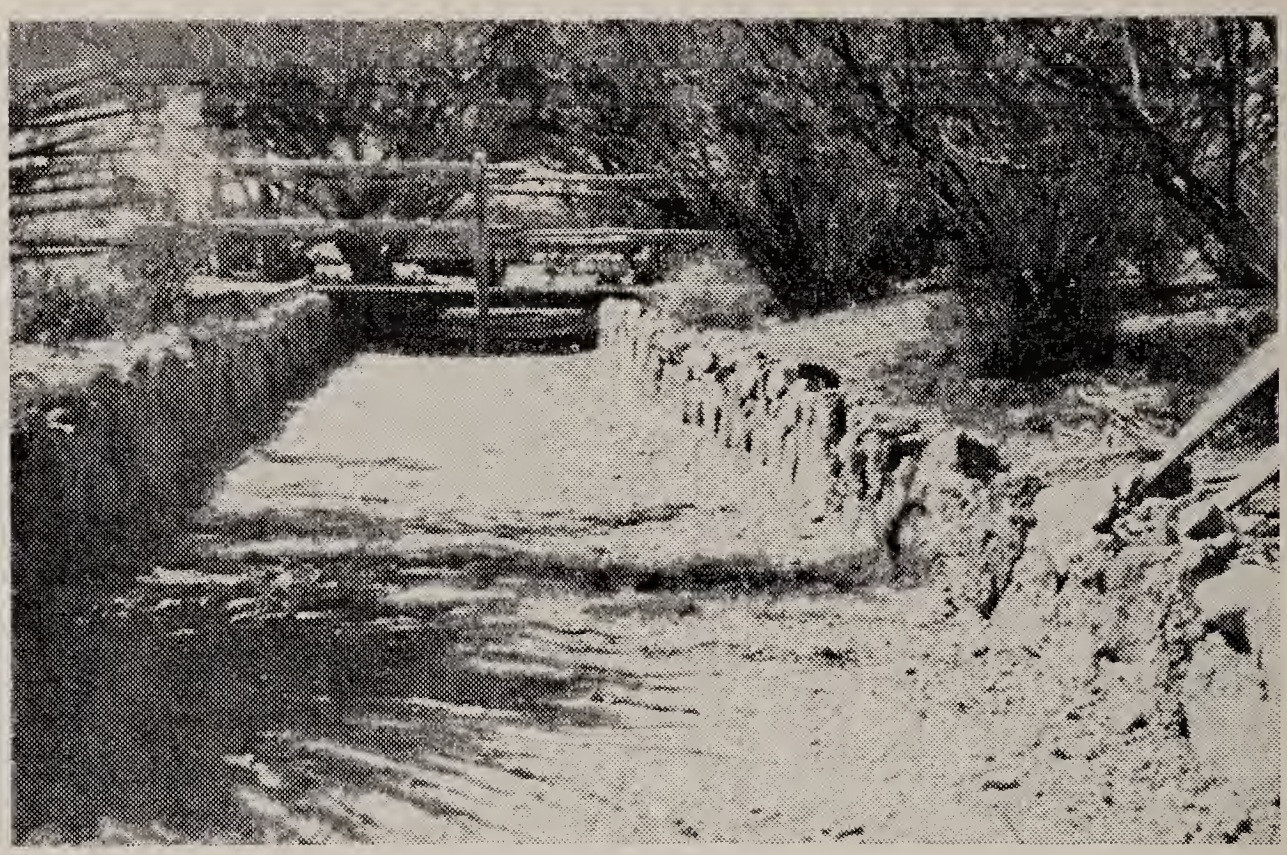
GARDEN IMPROVEMENTS SUMMER OF '59



Center left, shows new entrance canopy. Railings and posts were cut by the staff, below the Mogollon Rim last summer, hauled to the Garden and peeled.

Upper center shows new path built to make an easier flow of foot traffic. Note new beds along 'wash' built up of native rock.

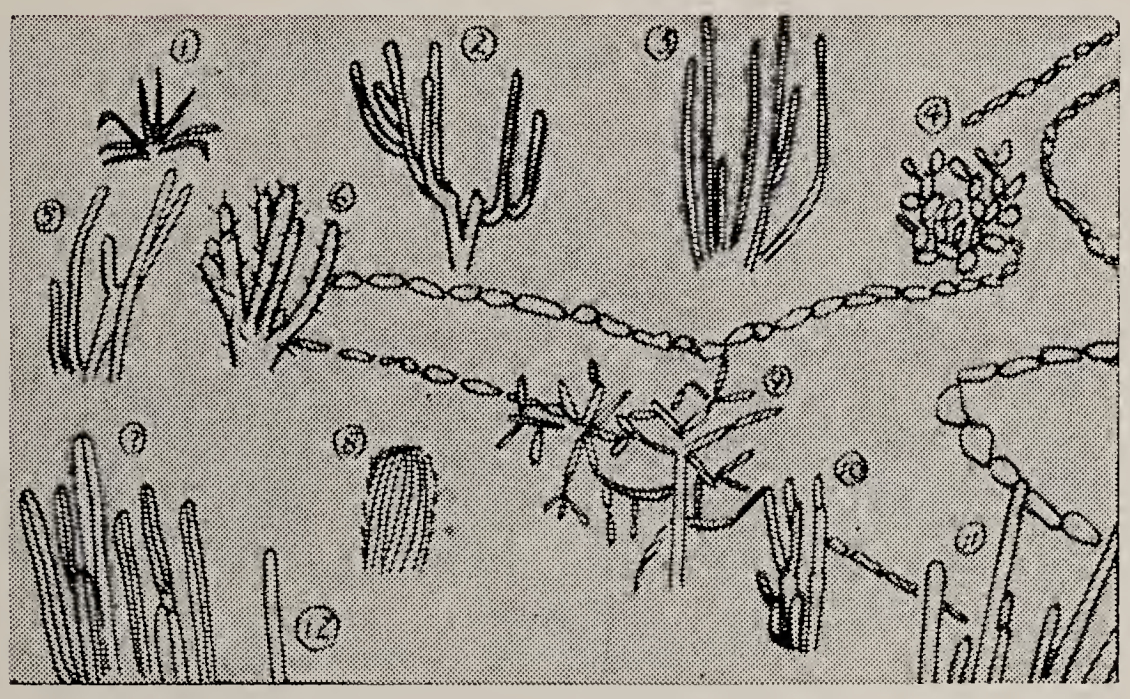
Pine poles used as guard rails over bridges



'Wash' rocked-in to prevent overflow during our few summer cloud-bursts.

The work was done this summer by our most versatile staff working together. John Weber pushed the erection of new pine-pole fencing; Ed Jones — carpentry and painting; Demetrios Vlachos — cement and rock work; your editor — jack-of-all-trades.

ON THE GARDEN'S NATURE WALK



1 — Agave decipiens; 2 — Lemaireocereus montanus; 3 — Lophocereus schottii forma monstrosus; 4 — Opuntia santa rita; 5 — Lemaireocereus stellatus; 6 — Stetsonia coryne; 7 — Lemaireocereus marginatus; 8 — Ferocactus acanthodes; 9 — Opuntia fulgida var. mamillata; 10 — Pilocereus palmeri; 11 — Lem. stellatus; 12 — Espostoa lanata.

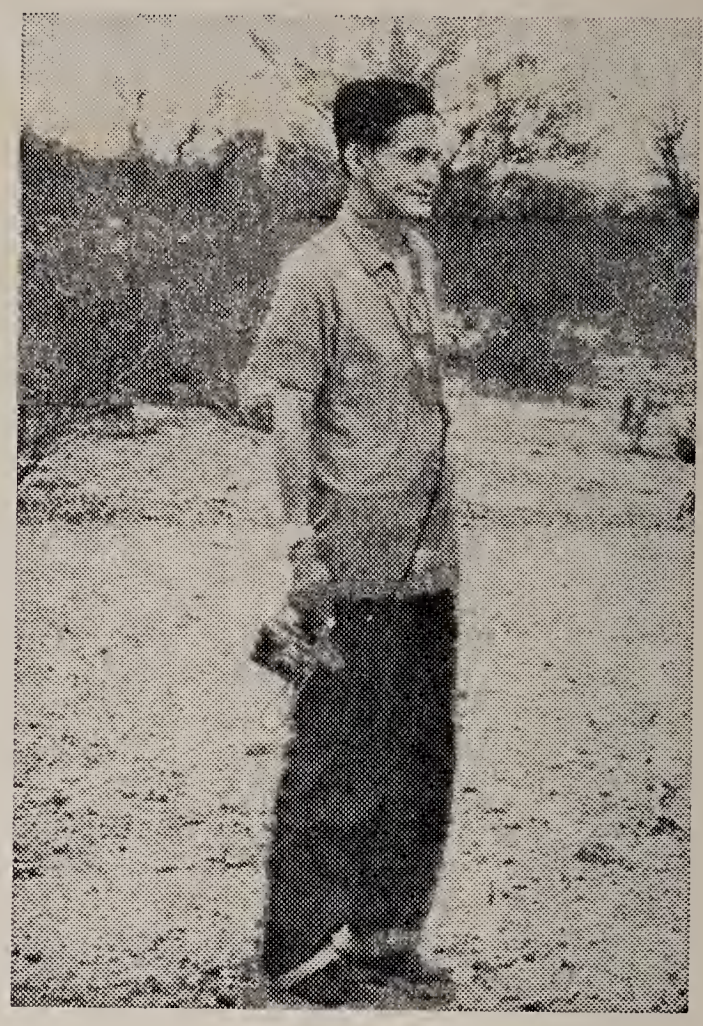
HIGASHIYAMA BOTANICAL GARDEN

On August 14th the Garden was favored with a visit from Mr. Koichi Mizuno, Director of the Higashiyama Botanical Garden, Nagoya, Japan, who remained with us until August 16th when he flew back to Los Angeles.

He had corresponded with us for some time relative to the possibility of growing some of the desert plants in Japan. So when the City of Nagoya decided to set aside a portion of their 130 acre Garden to desert plants, Mr. Mizuno was flown over to our country to study the flora of the deserts and our Garden plantings.

He had three fine days of studying plants, taking many photographs in the Garden and at our member's homes, driving and hiking thru the desert and left for home with seeds of 67 different desert plants that we had collected for him.

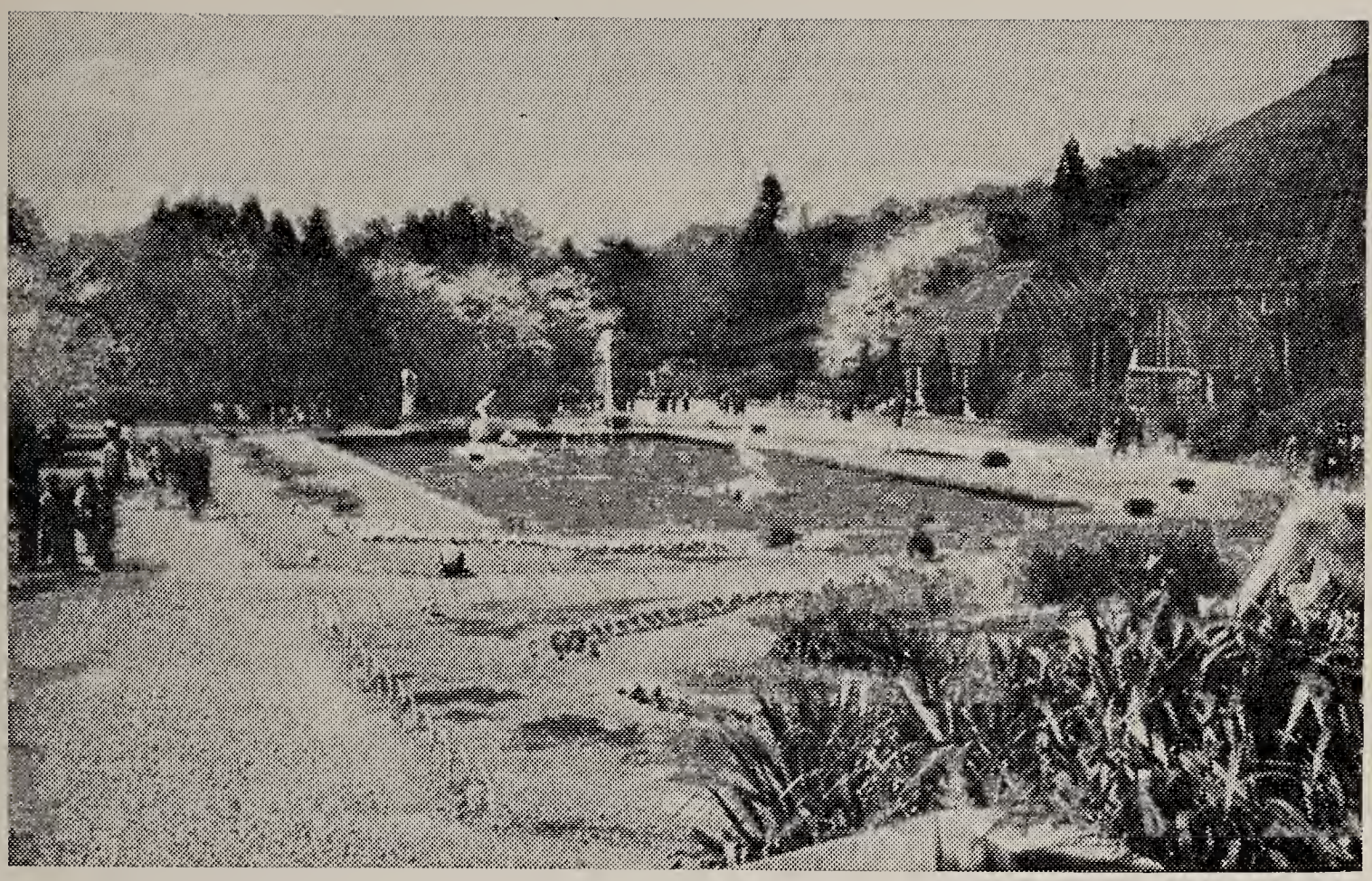
The Higashiyama Garden was started in 1937 and has over 12 buildings, some of which are shown on the following pages, and 33 employees are on the staff year around. Sections of the Garden are devoted to Roses, Azaleas, Alpine plants Apricots, Cherries, Bamboo, Educational gardens and in the near future a Desert Garden. A large Hawaiian House is in the process of being built and will be open to the public in 1961.



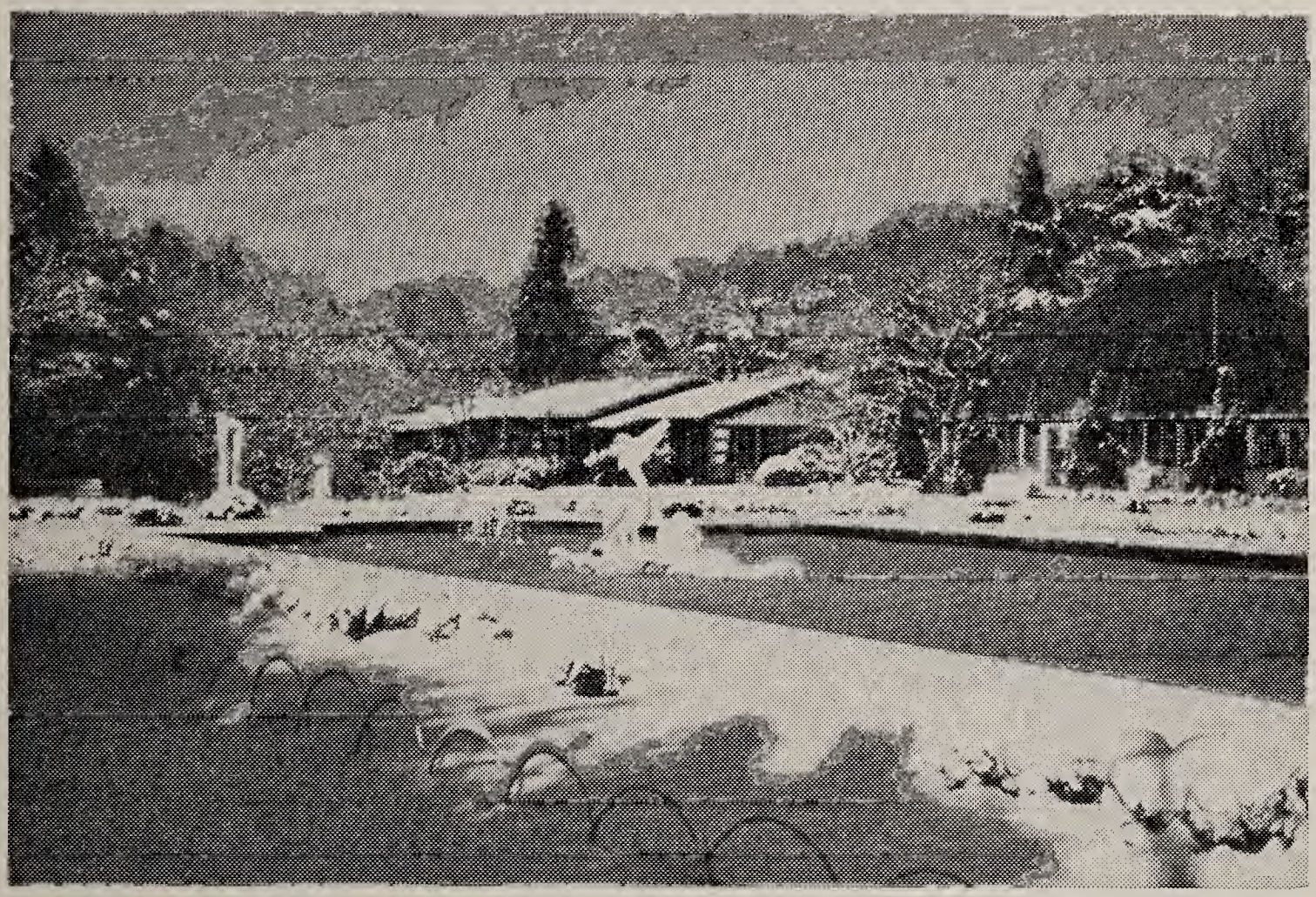
Director Koichi Mizuno

It will be with interest that we will watch the progress of this desert planting in a 'wet' area and we will continue to contribute to its existence.

Alpine garden in winter time. Temperatures go below zero and snow fall is about 14".



The formal pool. Large conservatory on the right is for exotics. The smaller glass conservatory to the left of large building houses cacti and succulents.



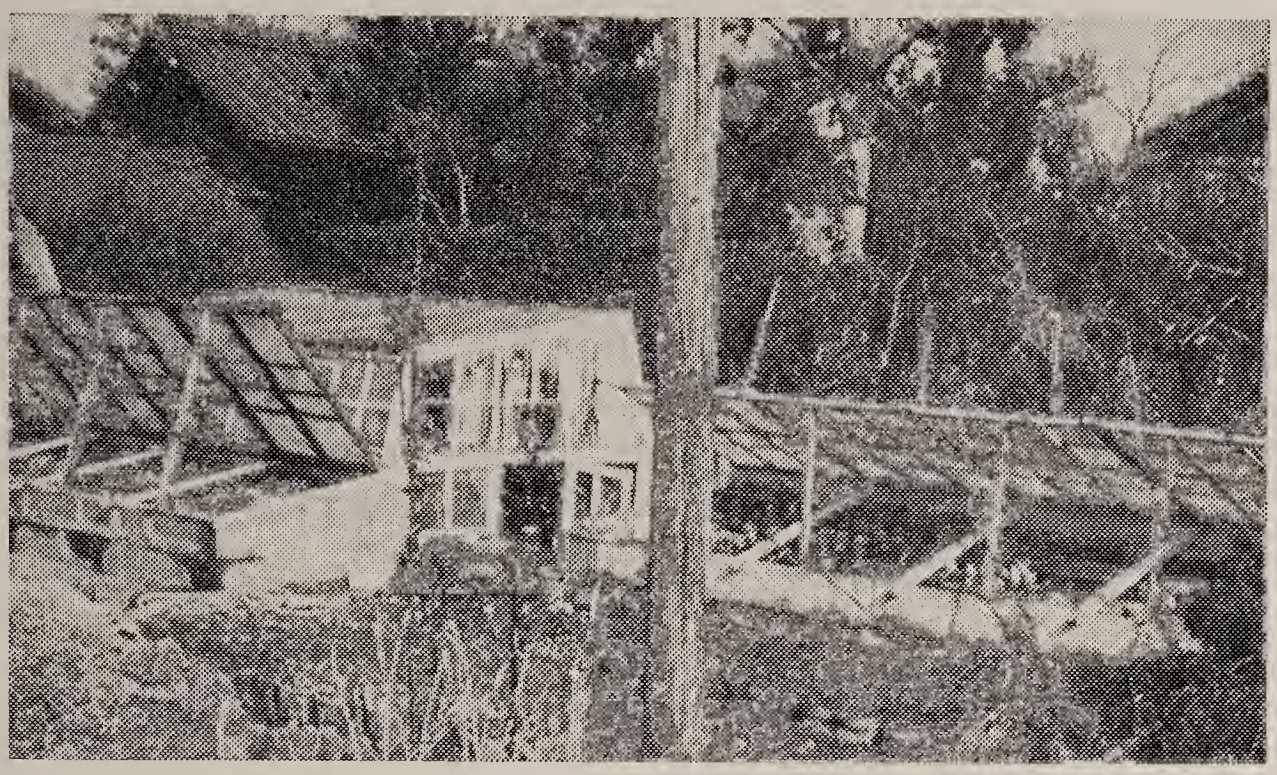
Same area in the winter time. In the center, rear, is the director's residence.

Cacti and succulents in Succulent House. Note the robust growth of the Opuntias.

In the late fall, all tender plants are protected from the cold with woven mats erected on long poles which gives the area an Indian teepee appearance.

COLLECTION OF MR. K. MIZOGUCHI

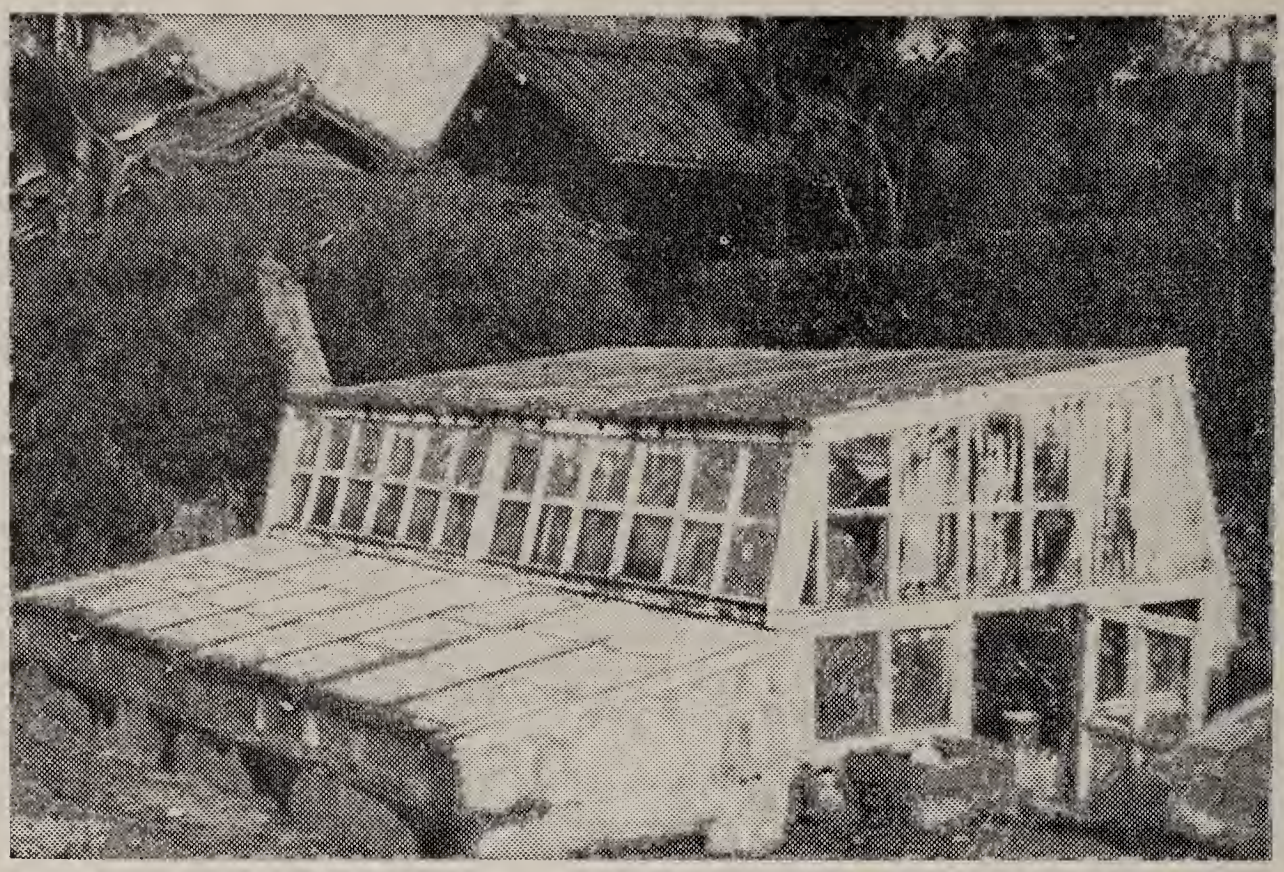
Editor of the
Chubu Nippon Press
Nagoya, Japan



Glass house and frames open to the heat.

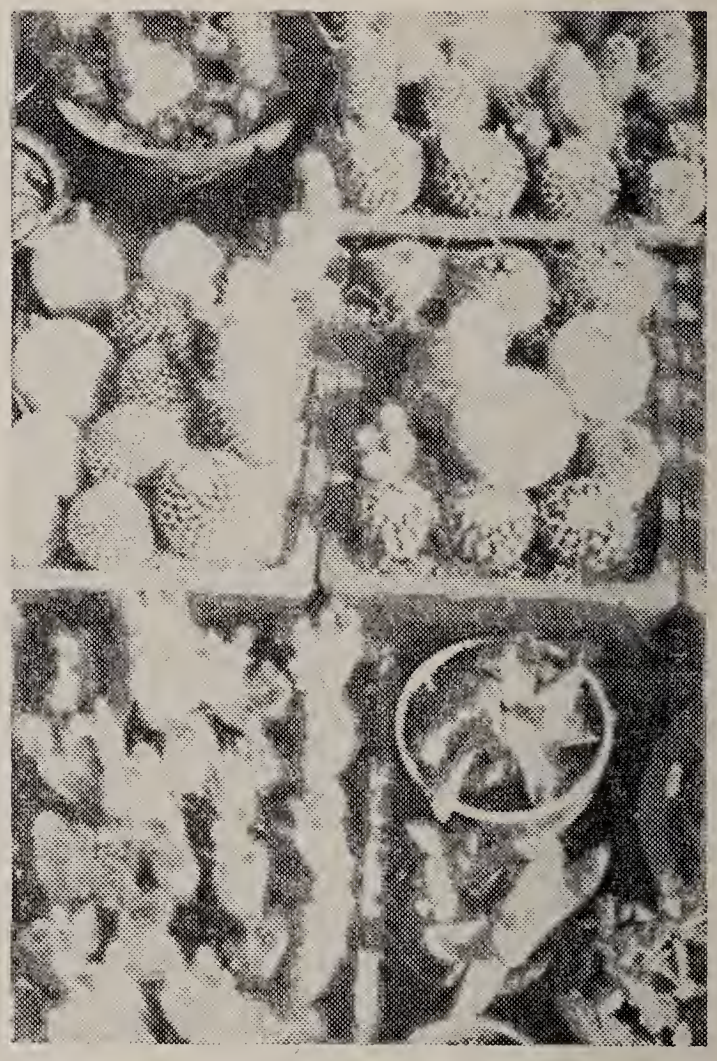
Specimen cacti and seedlings.

Cacti seedlings and Haworthias.



Glass house closed. Note that a portion of the house is below ground level.

Uniform and healthy cacti seedlings.



Compact and showy young specimen plants.

CARDO SANTO
Thistle
Aster Family

Cirsium undulatum Nutt.
Compositae

The thistle renders many more services than might be imagined from its hostile appearance, and its recognition for medicinal purposes dates from antiquity. The Romans called it **carduus** from which the Spaniards derived **cardo**.

For earache, Spanish New Mexicans mash the roots, warm the resultant juice, and put a few drops of it into the ear with cotton. For pains in the molars, the same part is boiled and the hot tea is held in the mouth. Those who suffer from diarrhea are given a decoction of its roots, and a similar preparation of its flowers is administered three times

Cirsium undulatam (Nutt) Spreg Herbarium sheet.

Cirsium undulatum. Close-up of blossom.

a day to those seeking relief from gonorrhea. A tea made from the boiled roots is said to hasten parturition.

Suelda consuelda, which has also been identified as a Circium, and which is said by the natives never to flower, is highly regarded as a healing application for fractured bones. One method is to mash the leaves and bind them over the broken part; another consists in peeling the root, and chopping it very fine. Still another prescription is to make a poultice from dough, with the crushed roots or green leaves, and two pinches of salt; this should be bound over the break. If the leaves are mashed, the pulp may be applied to relieve stiff neck and muscles taut from nervous strain.

Circium ochrocentrum Gray.

Circium ochrocentrum blossom.

While in Morocco, I found that among those few village men who are illiterate. the thistle is used as follows: three stalks are stripped of leaves and are stood so that they support each other over a brazier of hot coals. Some incense is sprinkled on the brazier and a paper on which some mysterious words have been written is placed over the stalks. The heat causes it to fly away. Under the spot where it lands, there is to be found treasure.

Ethnobotanical excerpt from 'Healing Herbs of the Upper Rio Grande' — L.S.M. Curtin, Laboratory of Anthropology, Santa Fe, N.M.

CALENDAR OF EVENTS FOR OCTOBER

Oct. 6th 8 P. M. CACTOMANIACS

Chas. Mieg — Review of summer.
collecting trips.

SAGUARO LAND BULLETIN

DESERT BOTANICAL GARDEN of ARIZONA

NOVEMBER, 1959

Echinocereus robustus
Peebles 1940
A beautiful spined plant with purple blossoms found on the Apache Trail north of Superstition Mts., 40 miles east of Phoenix.

REG MANNING

SAGUAROLAND BULLETIN

Published and owned by the Arizona Cactus and Native Flora Society, sponsors of the Desert Botanical Garden of Arizona, P.O. Box 547, Tempe. Saguaroland Bulletin attempts to promote the Garden and to provide information on the desert plants and their culture. Subscription $5.00 per year, the subscription including active membership in the Society and the Desert Botanical Garden. Issued 10 times a year.

W. HUBERT EARLE, Editor

Volume 13 NOVEMBER, 1959 No. 9

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NOTES FROM THE CORNER OF THE EDITOR'S DESK

ILLUSTRATED LECTURES: The fall season is now upon us and we will be in full swing this month. Our Thursday afternoon lectures will consist of six lectures running concurrently thru the season until spring as follows: Arizona Cactus in bloom; Arizona Wildflowers; Arizona Trees and Shrubs; Arizona Birds and Reptiles; Succulents other than Cactus; Collecting Plants in Mexico. We urge all of our members to attend these lectures and bring your friends and guests. Time is 3 P.M. each Thursday afternoon.

CLASSES: Last year we had a tremendous response to our Wednesday afternoon classes on "A Better Understanding of Desert Plants',. The classes this year will begin Nov. 11th and will continue for six weeks, then a Winter course will begin in January for six weeks and then the Spring course in March. This year the courses will be slightly changed to give the members more horticultural methods in growing the desert plants and a knowledge of what plants to use for desert survival. The subjects are as follows; Deserts and their Plants; Culture of Desert Plants; What are Succulent Plants?; Xerophytes & Mesophytes; Desert Survival Plants, and, the last lesson is an all day Field Trip for the purpose of identifying desert plants. As in the past there is no charge for enrollment in the classes which begin at 3 p.m. and continues until 4 p.m.

CACTOMANIACS: A fine group of over 50 turned out last month for the first meeting this fall. Chief Cactomaniac, Chas Mieg, has some interesting programs lined up for this winter. Meetings begin at 8 p.m. and are over at 9:30 but many evenings it is about 11 p.m. when the interested members finally disperse. All members and their friends are most welcome to attend these meetings where knowledge and nonsense are tolerated.

SUMMER PROJECTS: The staff had quite a list of projects for the past summer, which were shown on page 64 of the June-July Bulletin. We were able to accomplish all of them with the exception of "oiling of the parking lots". This has had to be held off for a while until we know the exact route of the road thru Papago Park which is to be constructed very soon by the City of Phoenix.

In addition to the projects listed, the staff erected a new lighting system from the Auditorium to the parking lots; extended water lines over 400'; relayed 175' of septic tank leach line and built a rock lined path from the main bldg. to the Archer House.

MEMBERSHIPS: A year ago, the Garden had 477 members. The membership at the present time is now 547 members, so you can rest assured that the Garden is also continuing to grow in memberships. A most interesting angle is that many of our members who had Active Memberships have encreased them to the Builder class ($5.00) and Builders have raised theirs to the Sponsor class ($10.00). We certainly appreciate all the faithful renewals.

FINANCES: Are in very good shape. We budgeted $1000 for Buildings and Improvements and used $990 during the summer. Salaries and other expenses are all in line. Income on sales and memberships are higher than same time last year. We are going into the winter with a good operating balance and also have over $6.500 in a savings account which is to be used for future building. It may be of interest to you to know that the staff collected over 130 pounds of cactus seed the past summer and have already wholesaled $1,850 to one seed company. We will also realize about $600 from over-the-counter sales of seed packages during the winter season.

CHAMISO
CHAMIS
SALTBUSH
SHAD SCALE
GOOSEFOOT FAMILY

Atriplex canescens Pursh

Chenopodiaceae

The saltbush is one of the commonest shrubs on the plains and in the arroyos and lower valleys of the state, and it is now being planted extensively, under governmental direction, on many areas in the Southwest to increase the growth of range vegetation and decrease soil erosion. One of the leading stockmen in Western New Mexico stated that saltbush "is a godsend in fall and winter, as a forage for sheep and cattle," although it sometimes causes more or less bloat among the sheep in summer, especially after rains.

The Indians, who have developed usages for so many plants, have adapted the **chamiso** to their purposes. On a Hopi mesa, in the village of Hano, the ashes of the saltbush are stirred into the batter of the purplish-gray waferbread in order to change the natural color of the ground meal into a greenish blue, as lime water is used by the Spanish New Mexicans to improve their blue meal porridge. The Zuni attach prayer plumes to the bush in the belief that this action will bring forth the cottontail rabbit in large numbers.

Nor are the other inhabitants of New Mexico behind the Indians in their reliance upon the saltbush. For at Tularosa the green leaves are chewed with a pinch of salt, followed by a swallow of water to relieve bad stomach pains.

Ethnobotanical excerpt from 'Healing Herbs of the Upper Rio Grande' — L. S. M. Curtin, Laboratory of Anthropology, Santa Fe, N. M.

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* Atriplex canescens is found throughout the State, 6,500' or lower, commonly in sandy, sometimes in saline, soil. Range is from South Dakota to Oregon, south to northern Mexico.

Fourwing saltbush, cenizo, chamiso, chamiza, often erroneously called "shadscale" and "sagebrush". This plant is adapted to very diverse soil and climatic conditions and is found in association with creosotebush, sagebrush, pinyon, and sometimes yellow pine. It is highly prized as a browse plant, and the fruits are so relished by livestock that reproduction is often greatly hindered. The plant is deep-rooted and should be useful for erosion control.

* 'Flowering Plants and Ferns of Arizona' — Kearney & Peebles, 1942.

ATRIPLEX CANESCENS Pursh
Closeup of branch showing winged fruit.

ATRIPLEX CANESCENS branch showing the large heads of fruit. These are relished by birds and livestock.

ATRIPLEX CANESCENS bush of about 4½' growing in saline soil. The bushes have a gray appearance and thus are mistaken for a sage.

ON THE GARDEN'S NATURE WALK

1. Palo verde tree (Cercidium microphyllum; 2. Undulating Prickly Pear (Opuntia undulata); 3. Cholla (Opuntia cholla); 4. Brittle Bush (Encelia farnesiana); 5. Young Saguaro (Carnegiea gigantea); 6. Nelson's Century Plant (Agave nelsonii); 7. Prickly Pear (Opuntia occidentalis); 8. Prolific Cholla (Opuntia prolifera); 9. Creosote Bush (Larrea tridentata); 10. Dejected Century Plant (Agave dejectens).

TRICHOCEREUS CANDICANS Gillies. A low growing night blooming cereus from near Mendoza, Argentina. A heavy spined plant that produces immense blossoms in the spring.

TRICHOCEREUS PACHANOI Britton & Rose. A showy plant from high in the Andes of Ecuador. This plant produces buds in the spring but they appear dormant until cool weather in the fall, then they produce, overnight, large blossoms that stay open until about noon. This is an easy growing plant for indoors or outdoors and grows up to about 8' then it seems to want to fall apart unless braced.

Maricopa Audubon Society, an ardent bird lovers club, on a plant identification hike conducted by your editor. The Garden Staff is always available for any groups who desire to know the desert plants.

*FLOWER SEED DRYING, STORING AND PACKAGING

HISTORY

Ever since man adopted an agricultural way of life seed has been important, even essential, to his existence.

The problem of preserving a supply of seed from year to year, or for longer periods in case of crop failure, has received serious attention for hundreds of years. Protection from rodents and insects is not enough. The vitality of the seed must be protected, too.

Longevity tests have been a popular research subject during the past fifty years, and although some of the conditions selected as contributing to the length of a seed's life seem strange to us now, each of the tests did contribute to the general knowledge either by eliminating false notions or revealing a factor which assists in the preservation of seed vitality.

Because of the economic importance of vegetable and field seeds most of the research devoted to the problem by public and private institutions has been concentrated in those areas. As a result, little data has been assembled on flower seeds specifically although generalizations are now possible in identifying the most important factors effecting longevity for all kinds of seeds.

Attention was first directed to the problem of storage, for it was obvious that the same seed stored under various conditions had wide differences in germinating ability even after relatively brief storage periods.

When pertinent information about what constituted good storage became available it pointed up the fact that seed germination cannot be increased by good storage, but only maintained, and that good germination was heavily dependent on good processing of the seed before storage began. This was a whole new problem — how to put seed into the best possible condition to enter a long dormant period.

Finally, there was the problem of extending ideal storage by specialized packaging to keep seed undamaged through thousands of miles of shipment and widely varying humidity and temperature conditions.

THE STORAGE PROBLEM

When seed has been brought into a weather-tight storage area, when fumigation has killed insects, and when rodents are brought under control the last enemy to face is old age.

Seed ages at varying rates depending on the kind and on the storage conditions. Bodger data published twenty-three years ago gave a compilation of longevity periods for many kinds of flower seeds stored under ordinary warehouse conditions at El Monte, California.

It soon became apparent that although those figures could be applied to an average crop stored in Bodger warehouses, not all crops are average, and storage conditions in other parts of the country and the world are different and generally poorer than those in the arid El Monte region.

The storage problem begins the instant the harvesting operation begins, for what might otherwise have been perfectly good seed can be ruined in a matter of hours. The critical factor is moisture. How dry seed should be before it is brought in from the field has been a matter of guesswork from time immemorial. Harvest too soon and the seed "heats" or molds in the bag; wait too long and the flower heads reach the end of the plant cycle and release their seeds to fall to the ground or be blown away by the wind. The harvest time,

*Copyright 1958 by
DODGER SEEDS Ltd., El Monte, California, U.S.A.

that exact day which is best of all, no longer need be determined by the estimate of the grower. It can be measured to the last percentage point by quick, accurate, electronic moisture testers in the same way that the ideal harvest date for citrus fruit is calculated by laboratory tests of acidity.

How dry must seed be at harvest time? How much difference in allowable moisture content is there between the many varieties of flower seeds? How dry must seed be for storage in large bags? What is the best temperature, the best humidity for the storage area? The answers to these questions are now known or are becoming known for every genus and species of cultivated crops.

THE PROCESSING PROBLEM

Since unfavorable weather frequently prevents a crop from maturing to ideal moisture content in the field, seed must be harvested at higher-than-optimum moisture percentage on many occasions. Under these conditions provision must be made for completing the drying of the seed which was not possible in the field.

The practice in earlier times was to spread the seed on the floor of a building protected from moisture until it was dry enough to be sacked safely. It is still regular practice in th eflower seed industry to spread incompletely matured flower heads or even full plants on canvas sheets until they have dried to the point where the seed will readily separate in a threshing operation. Canvas is used instead of field windrows because the seed shatters (sometimes almost explosively) from the plants much more easily than most agricultural crops such as cereal grains and would be lost if it were not on a sheet.

Through long-term experiments it is possible to determine the optimum moisture content of each kind of seed. These amounts vary from as little as 2% to as much as 8% in most crops. When the optimum has been determined the next step is to design a system of drying which will attain that moisture content without injuring the seed in the process.

No seed ever attains optimum moisture content in commerce unless it has been dried artificially to that point.

THE PACKAGING PROBLEM

Until the level of moisture which contributed most to the longevity of a certain kind of seed was determined there was not much need for moisture-proof packages. In fact, if the amount of moisture present in seed was much above the ideal, sealing it in an impervious container hastened the death of the seed. Early experiments in canning seed sometimes gave unfavorable results because of this factor.

However, it is true that most flower seed spends less time in the hands of the grower than it does in the distribution system which brings it finally to the gardener. Therefore, ideal moisture content determined by long-time experimentation, attained by scientific processing, and preserved until shipment by humidity and temperature controlled storage rooms could very well be wasted if the seed then spent a year or more moving under uncontrolled conditions from grower to distributor, to dealer, to consumer.

The need in this situation is to invent containers which are moisture vapor transmission proof enough to be able to provide an extension of the ideal storage of the seed until it is necessary to repackage into smaller units for final distribution.

THE VITALSEAL PROGRAM

The answer to the various problems of processing, storage, and packaging is an integrated program which takes each factor into account. Unless scientific processing is followed by proper storage, and then by proper packaging to maintain the advantages gained during processing and storage the effort spent on any portion of the seed program may be wasted.

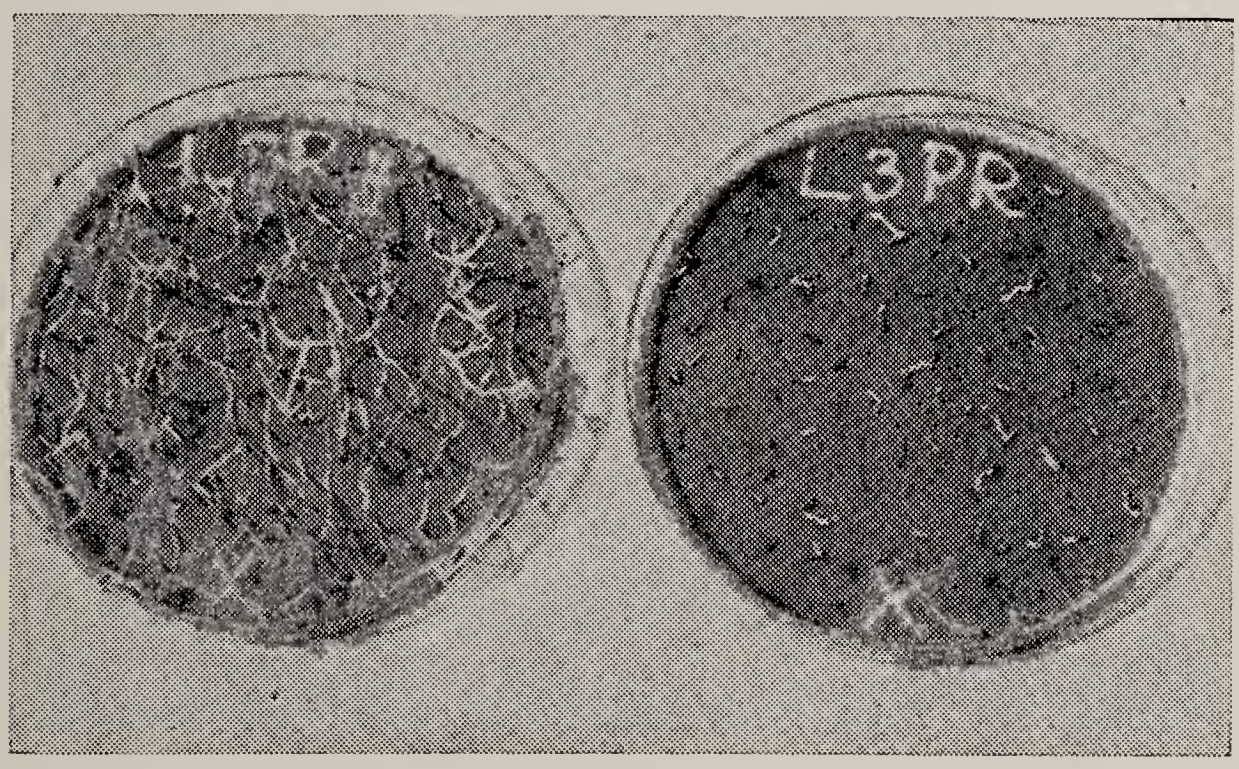
There is a large body of literature substantiating the fact that seed lives longer if it is dry, drier than it becomes in any normal storage without strict humidity control. References are given at the conclusion of this bulletin. But there is also ample evidence that it is dangerous to dry seed beyond a certain point.*

Since there has been relatively little work done in flower seeds so far as the moisture percentage and longevity relationship are concerned, Bodger began a series of tests in conjunction with the Random Seed Laboratory some years ago. These tests were confined to flower seeds of economic importance having comparatively brief normal life span.

Testing longevity is a very long-term project, and a bulletin such as this one can hardly be more than a progress report, since successful processing and storage treatment results in extremely long life even to seeds like larkspur which are usually considered viable for only one season. But the time covered by this progress report is already greater than the time seed could be expected to be held in storage, even under the most unfavorable market conditions, and for that reason it is of immediate importance to the seed trade.

For instance, a sample of larkspur seed grown in 1954 germinated 95%, and after drying and optimum storage still tested 92% in April, 1958. Aster

* Kosar & Thompson: "Influence of Storage on Dormancy and Longevity of Lettuce Seed", "Proceedings of the American Society for Horticultural Science Vol. 70, 1957.



THREE YEAR OLD ASTER SEED

Left, aster seed processed to low moisture content, sealed and stored at uniform temperature, then opened and left at room conditions for 6 months. Original germination was 94%; germination of this sample is still 94%. Right, same aster seed stored in paper packet at room conditions for entire period. Germination 31%.

seed also grown in 1954 began the test period at 94% and the sample given ideal conditions after drying still tested 93% in April, 1958. The accompanying table and photographs give additional information concerning this series. The photographs were taken of germination samples in 1957 when the seed under test was 3 years old.

Some longevity tests in the past have involved refrigeration as the principal preserving factor. Seed stored in this way often showed good germination after long periods, but unfortunately the seed deteriorated very rapidly after being brought out of storage and had to be germinated within a matter of days after removal. Rapid loss in germinating ability after storage would make such storage of little or no economic importance, so one of the purposes of the Bodger-Ransom series of tests was to determine a technique which would result in good germination for a considerable period of time after there was no longer any control over either humidity or temperature. In this way seed could be dried and stored under professional techniques and be safe to handle under ordinary conditions after being removed from controlled humidity and temperature.

Germination tests as reported in the accompanying table were not made directly upon opening the sealed packages. Each of the kinds of seed tested was brought out of storage, opened to the air, and stored at the varying humidity and temperature of ordinary room conditions for a period of 6 months preceding the test. This closely simulates the actual conditions in the seed trade, for most seed can be kept under professional supervision to within 6 months of planting. These tests would indicate that under certain conditions seed can be placed in suspended animation for a period of years and will then deteriorate only at the same rate as would have been the case had it not been stored at all. The Vitalseal program is designed to duplicate these conditions on a commercial scale.

TO BE CONCLUDED IN THE DECEMBER ISSUE

CALENDAR OF EVENTS FOR NOVEMBER

Nov.	3	Cactomaniacs	8 P.M.
	5	Lecture — Arizona Cactus in bloom	3 P.M.
	11	Class — Learn your desert plants	3 P.M.
	12	Lecture — Arizona Wildflowers	3 P.M.
	16	Meeting of Combined Boards	8 P.M.
	18	Class — Culture of desert plants	3 P.M.
	10	Lecture — Arizona Trees & Shrubs	3 P.M.
	20	Lecture — Arizona Trees & Shrubs	3 P.M.
	25	Class — Succulent plants of the desert	3 P.M.
	26	Lecture — Birds & Reptiles of Arizona	3 P.M.

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DESERT BOTANICAL GARDEN of ARIZONA

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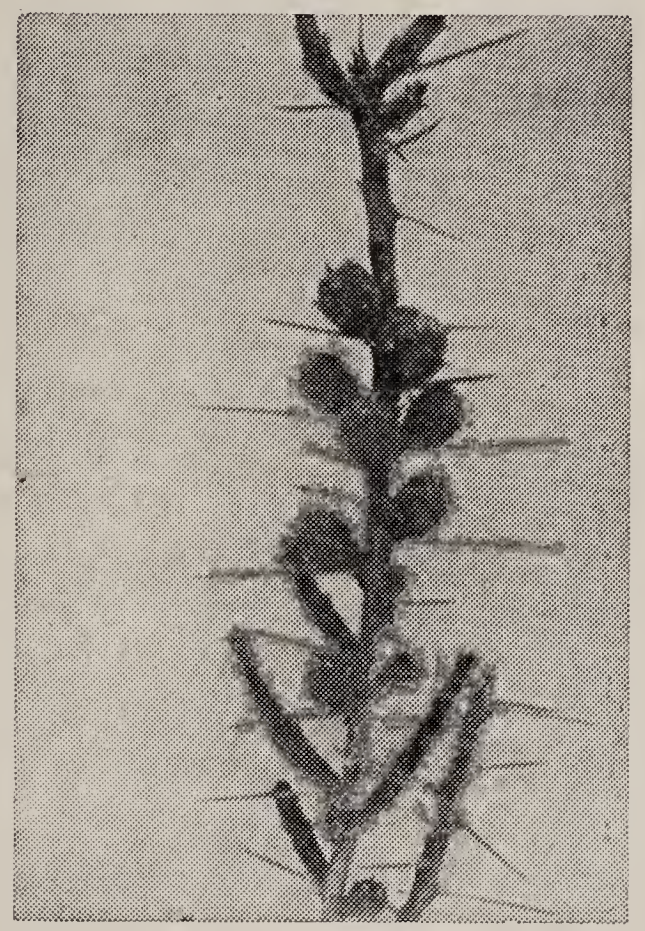

Stem of Desert Christmas Cactus. *Opuntia leptocaulis* De Candolle 1828.

The red fruits of this 'pencil-cholla' ripen in Nov. and remain on this shrub-by cactus during the holiday season to give it a colorful appearance on the desert.

REG MANNING

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Feliz Navidad y Feliz y Prospero Ano Nuevo

TO ALL OF THE MEMBERS OF THE GARDEN
FROM THE: — OFFICIAL BOARD
ADVISORY BOARD
GARDEN STAFF

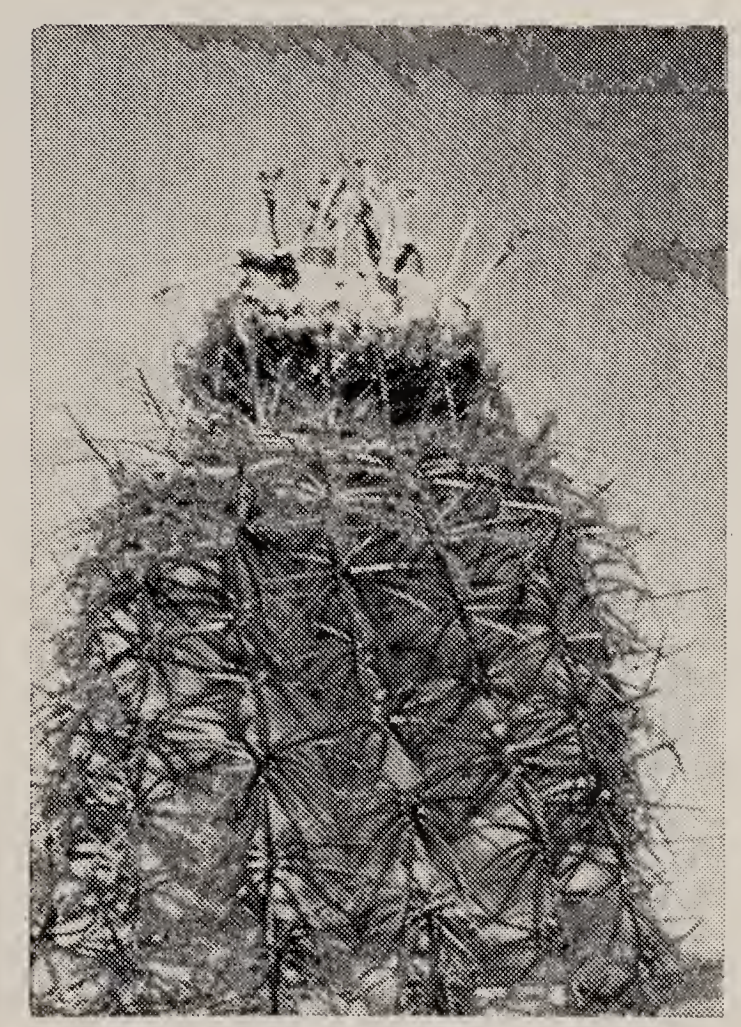
COLLECTING CACTUS IN STATE OF COLIMA, MEXICO

C. E. MIEG
Scottsdale, Arizona

There are stretches on Mexico's West coast which are still little explored and offer an interesting field for plant collecting. Last May my wife and myself met Hernando Sanchez Mejorada of Los Mochis, in Manzanillo and missed our other friends from Mexico City, by a few hours due to poor mail deliveries.

A new paved road from Lake Chapala to Manzanillo which rises to above 8000 feet had been worked over a few years previous by Gus Herman and myself but at that time we could not proceed North from Manzanillo as the roads were not passable. Today a new paved road goes North to Barra Navidad, a fishing village on a sand spit. Two or three rivers have to be crossed as the bridges are not installed yet. This must be done in the dry season and even then can be a trying experience. This road leads through jungle, swamps and coconut groves. Barra Navidad is the end of the road and from there progress North has to be by boat to Puerto Vallarta or San Blas at which latter town another paved road meets the sea.

We hired a boat to take us to Tenacatita, a palmthatched "Hotel" which boasts of adobe floors, no plumbing, no ice, no electricity and quite often no food. Never-the-less the place was spotlessly clean and had great charm in a sort of South sea Island sort of way. Transportation from there was by "Station Wagon" an ancient Ford truck without battery and only three cylinders working. It was started by pushing it along the beach and whenever we went exploring a few Indians came along to get us started again after our frequent stops.



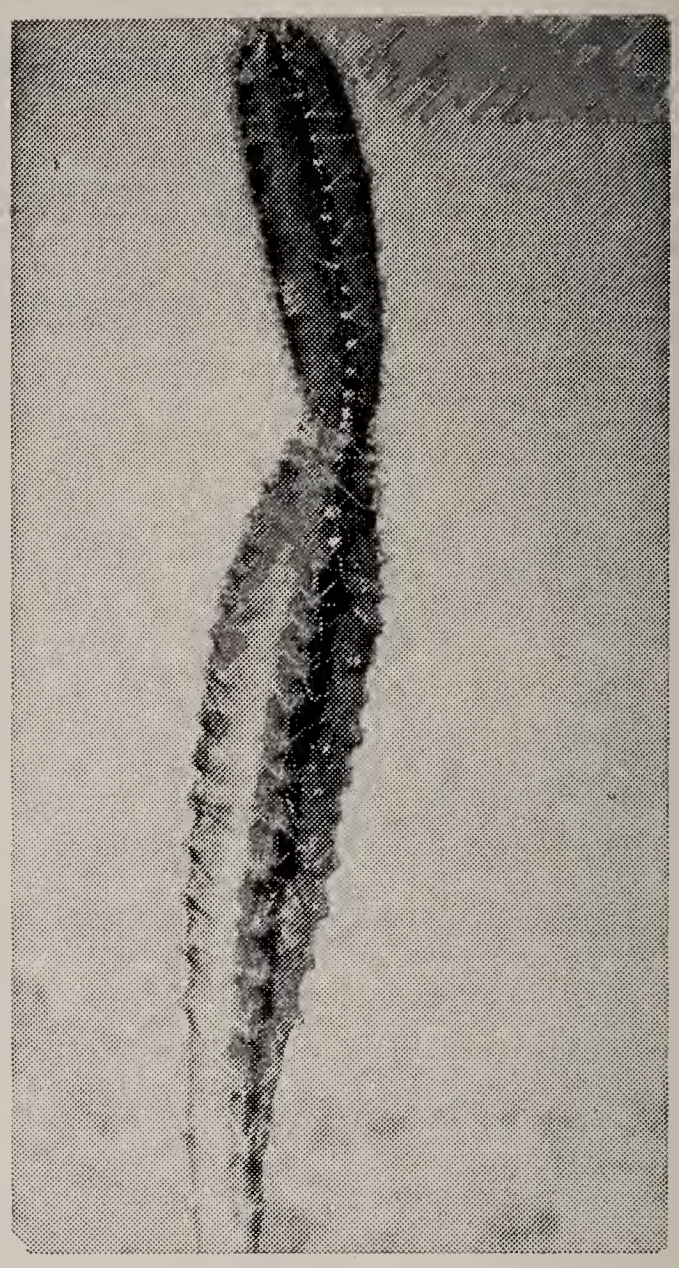
Turk's Cap
Melocactus recurvus collected near Tenacatita. This cactus develops an unusual 'cap' or cephalium.

What appears to be a new Peniocereus was found by Hernando in the rocks of an estuary, its tuber about 18 inches long and the branches up to 12 feet long. Melocactus recurvus was all over the grassy spots on top of the cliffs which lined the shore. Mammillaria jaliscensis was carpeting the rocks with their pink flowers. Pachycereus pecten aboriginum and Lemaireocereus standleyi were also along the shore line. This plant was found on our previous trip near Manzanillo but we passed it up as a Rathbunia, which it resembles. This time we found both flowers and fruit so there was positive identification.

On the penisula of Manzanillo we found another Peniocereus which we failed to identify. These grow unbelievably fast from cuttings and immediately form new tubers. Some of the plants had several tubers and possibly this may turn into a Wilcoxia after it has flowered.

Aside from plants which are well known we found there also a Lemaireocereus or Pachycereus which we could not identify. This plant grows to 20 feet but has but 3 or 4 branches, and has only 5 ribs with the areoles placed an inch or more apart. Neither flower nor fruit was found. An Agave, similar to A. prolifera, grew on the cliffs right above highwater mark. The leaves were from gray to a redishbrown. I brought 6 of these back with me but none survived our summer. Seeds also were collected and we may have better luck with these. A number of other succulents were collected and a few are surviving in my garden.

Except for the usual inconveniences of traveling back roads in Mexico, this



Peniocereus sp. A new species collected by Hernando Mejorada of Los Mochis, Mexico.

was one of the most satisfying expeditions we ever undertook.

We plan on a return to Tenacatita, with ice and a bigger boat next time. The fishing and skindiving for shells and coral alone makes it worth while. However the October 23rd hurricane has probably wiped out all habitations along the shore and it will take some time for re-building if they re-build at all.

Enclosed with this Bulletin is a Price list and a return envelope which you may use to order gift items from our Book Store for the holiday season. All prices include mailing. Your support of the Garden is always appreciated.

CHICO
TOMATILLO
RABBIT THORN
CHICO BUSH
NIGHTSHADE FAMILY

Lycium pallidum - Miers

Solanaceae

Lycium andersonii A. Gray 1862. Desert Thorn. Wolfberry, Squawberry.

This homely, spiny shrub, with stubby leaves and small red berries was one of Fremont's discoveries in 1844, although the Spanish residents in our Southwest had already known it and given it the affectionate term of **tomatillo,** after its berries which greatly resemble a small tomato, and **chico,** little one. Nor had the Indians of this region neglected the existence of this inhabitant of mesas, washes, and arid stony hillsides. According to Dr. Washington Mathews, an army surgeon who lived in their country for many years, the Navajos gave the berries sacred significance. The Zuni treated them with great reverence as an intercessor with the gods of the harvest, and so their priests would, when the berries appeared upon the bush, sprinkle it with sacred meal, saying the following pray-

Flowers of *Lycium andersonii* A. Gray 1862, X 1½

Stem of *Lycium pallidum* Miers, 1854, X ¼

er: "My father, I give you prayer-meal; I want as many peaches as your berries." They also considered the boiled berries were a real table delicacy.

Among the New Mexicans the red fruit is eaten raw if perfectly ripe, or boiled and consumed as a separate dish or in combination with stews and soups to give them a particular flavor. This **tomatillo** is frequently dried and stored away for winter use.

I have been told that horses or cattle will not touch the **chico**, but that it is fattening fodder for goats and sheep.

Ethnobotanical excerpt from 'Healing Herbs of the Upper Rio Grande' — L.S.M. Curtin, Laboratory of Anthropology, Santa Fe, N. M.

Stem of *Lycium andersonii* A. Gray, 1862, X 1/5

* LYCIUM: Desert-Thorn, is also known as Squawberry and Wolfberry and have contributed to the subsistence of the Indians. Several of the species produce abundant quantities of insipid, slightly bitter, juicy berries that are eaten raw or prepared as a sauce. Probably all of the native species furnish winter forage for livestock. They grow commonly along washes and on dry slopes, in desert or semi-desert areas. Some of the species tolerate a rather high degree of soil salinity. All of the Arizona species, with the possible exception of **L.pallidum** shed their leaves and become dormant during periods of drought, refoliating quickly when conditions become favorable. They flower regularly in spring, often again after summer rains.

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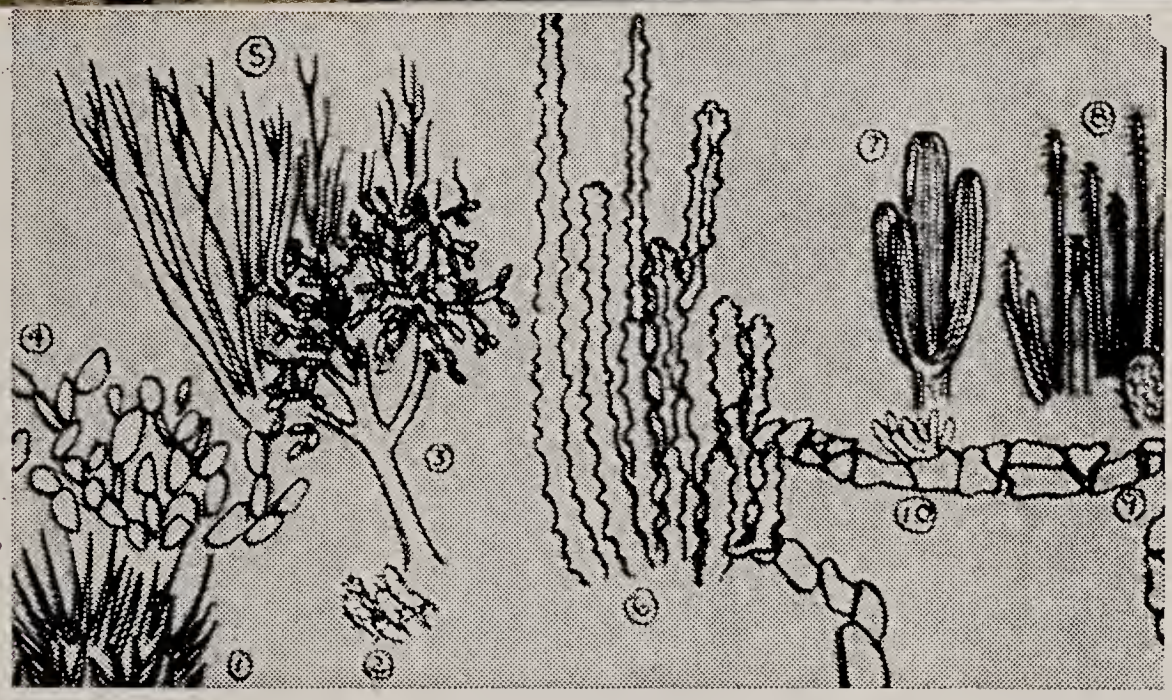
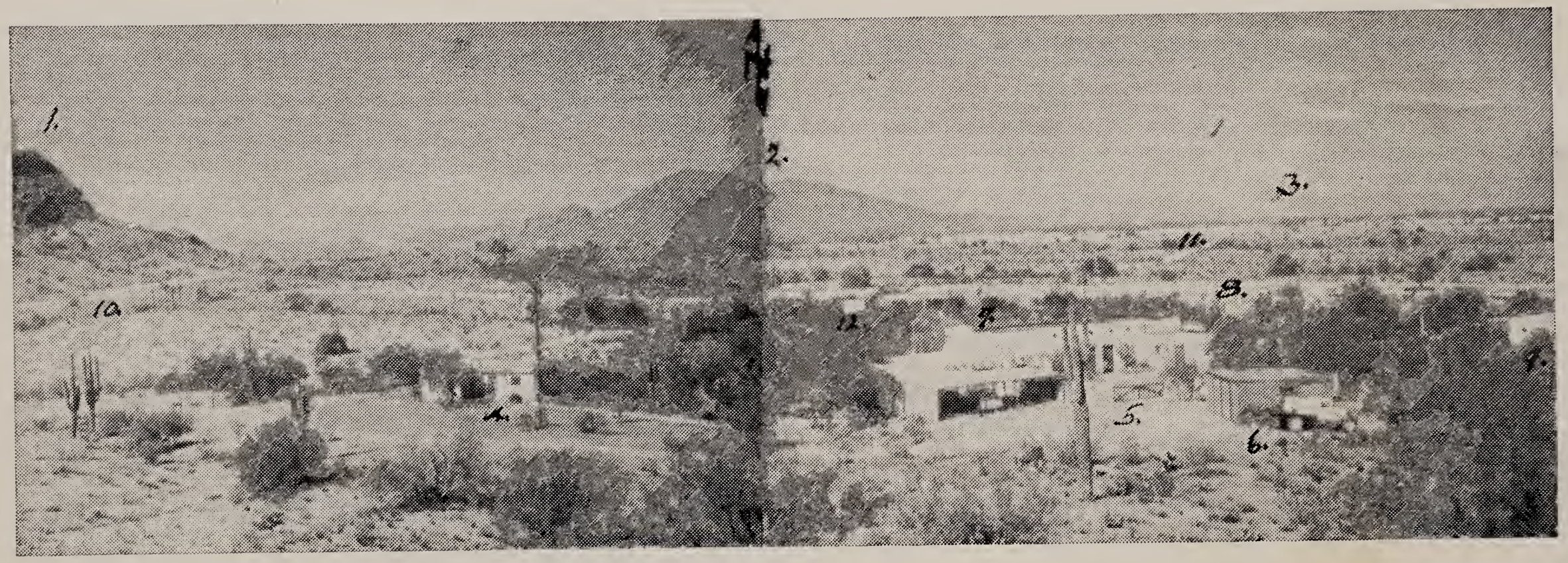
*Flowering Plants and Ferns of Arizona' — Kearney & Peebles, 1942.

ON THE GARDEN'S NATURE WALK



1. Silver Century Plant (Agave nelsonii); 2. Nichol's Hedgehog (Echinocereus engelmannii var nicholii); 3. Tree Cholla (Opuntia cholla); 4. Prickly Pear (Opuntia occidentalis); 5. Peninsula Ocotillo (Fouquieria peninsularis); 6. Totem Pole Cactus (Lophocereus schottii var monstrosus forma obesa); 7. Cardon (Pachycereus pringlei); 8. Senita Cactus (Lophocereus schottii); 9. Red Barrel (Ferocactus coloratus); 10. Brandegee's Hedgehog (Echinocereus brandegeei).



A panorama showing about ¼ of the Garden's 150 acres. 1. Barne's Butte at our N/W corner; 2. Camelback Mt. which is 8 miles north of the Garden; 3. Famous Paradise Valley; 4. Archer House (Director's dwelling); 5. Administration Bldg. with 2 apts., Office, Library, Auditorium & Herbarium; 7. 6,000 sq. ft. aluminum lath-house; 8. Parking lot for 180 cars; 9. Rest rooms; 10. West Entrance; 11. North or McDowell Rd. entrance; 12. Propagation glass-house.

*FLOWER SEED DRYING, STORING AND PACKAGING

(Continued from last month)

DRYING SEED

The hybrid corn industry has led the way in the drying of crops for seed purposes, and much valuable information about air temperature and handling of unusually immature seed has been gained in relation to corn drying. The danger of excessive temperatures, particularly when seed is quite high in moisture content, is very clear, but since different kinds of seed have different degrees of tolerance research is necessary for each genus.

Variable drying temperature, strictly controlled, plus a method of extracting most of the moisture from the air, also strictly controlled, are prime factors in a safe drying system. With the Bodger Vitalseal equipment a wide range of conditions is attainable, with the capacity to deliver air of safe temperature and a relative humidity of as little as 1½%. This is air so dry that only a few moments exposure results in severe irritation of the mucous membrane in humans. The driest deserts on earth have many times as much moisture in their atmospheres.

KEEPING SEED DRY

Once seed has been dried to the proper moisture content for its type an immediate imbalance in moisture vapor pressure must be anticipated. Moisture vapor is a gas which travels with ease through thick concrete, brick, stone, wood and most insulating materials commonly used for barriers against heat or cold. It will travel considerable distances against a stiff current of air, and it will penetrate rapidly many materials like cellophane which we commonly assume to be moisture-proof.

So a genuinely effective barrier is more difficult to achieve than might be assumed. Tin boxes, soldered shut, have been used to ship seed to tropical regions. Tin cans are used now in the vegetable seed segment of the industry, where quantity units are larger than in flower seeds. But in flower seeds, particularly in such very expensive seed as F^1 hybrid petunias, the units of sale are small and tin cans too cumbersome to be desirable. Ordinary plastics leak moisture vapor at varying rates, but none appear to be useful without reinforcements.

After a considerable period of testing various combinations of materials a specially manufactured lamination of polyethylene aluminum and Mylar was selected for the Vitalseal package. This package has an extremely low moisture vapor transmission rate. Seed sealed in these packages has been kept in such hot, humid conditions as a seed germinator (about 90% RH, 80°F) for many months with so little increase in moisture as to be indiscernable with a moisture tester. In addition to virtual impermeability, the laminated style envelope package is perfectly flexible in adaptation to various sizes, from fractions of an ounce upward.

TEMPERATURE CONTROL

While control of moisture and oxygenation in seed through artificial drying and then sealing greatly increase the life span, the very best conditions also avoid fluctations in temperature.

It is an odd fact that the very spot in most establishments which was most avoided in the past has become the best place to store seed when preserved in Vitalseal packages. This is the basement of the building. Excessive humidity is of no problem whatever, for the packages are not only impervious to moisture, but they are also made of materials which never rust or corrode. But the

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THE VITALSEAL PACKAGE

The laminated polyethylene-aluminum-Mylar Vitalseal package is so tough that it is almost impossible to tear with the fingers but is cuts easily with scissors or knife.

basement is generally the area which has cooler and less variable temperatures, both factors being conductive to good storage.

EFFECT ON THE TRADE

The Vitalseal program of drying, storing and packing seed with rigid humidity control will have an immediate and a long-term effect in the flower seed trade. The immediate benefits are apparent.

First, no seedsman need be concerned about high humidity in his own place of business so far as damage to sealed inventory is concerned. Second, no seedsman need be concerned about the humidity the seed has had to endure in transit from El Monte. This second consideration is of particular importance to antipodal customers who have always had to anticipate loss in germination when seed has traveled by ship across the equatorial regions. The actual situation is of no consequence, since the seed travels and is stored in a capsule of perfect atmosphere all its own.

Of somewhat more extended benefit is the ability of seedsmen to eliminate

or greatly reduce inventory loss in what was formerly highly perishable seed. Suppose anticipated sales of an expensive variety total one pound and the normal length of life of that variety is a single year, as in the case of asters. Instead of ordering a single one-pound package the seedsman may now order four quarter-pound packages, or any other combination he desires. Then during the course of the period when he is awaiting sales the seed in all the sealed packages remains in suspended animation. He may have opened only a single one-ounce package for current supplies. In this way only a small part of his inventory is exposed to damaging humidity at any time, and if his estimate of the season's sales is high, then he can carry over seed safely for the following season which have been a total loss had it not been protected by Vitalseal.

Seedsmen selling to market growers may wish to order in units of merchantable size so that sealed grower's packages can be delivered in original condition to the cutsomer, with ideal storage then continuing until the actual time of planting.

An additional benefit to Vitalseal packages is the fact that with the advent of sealed encloseures it is possible to label each package with a lot number as well as the variety name, making origin and parentage readily identifiable.

Seedsmen who carry large stocks of flower seeds will find an appreciable savings in the cost of germination tests, since no testing is needed while the Vitalseal package holds the seed in suspended animation.

SUMMARY

The safe storage of seed has been a problem for thousands of years, but only in the last fifty years has there evolved an understanding of the factors governing longevity.

Of all the factors involved the most important is an unvarying moisture percentage in the seed. The next most important factors are sealing the seed away from changes of air and maintaining a uniform temperature during storage.

Research has been extensive in vegetable and field seeds but much more limited in flower seeds. The first Bodger publication concerning flower seed longevity appeared in 1935. The irregularities reported as a result of varying storage conditions in various parts of the world led to further research and culmination in the Vitalseal program for processing, storing and packaging flower seeds.

Testing continues, but at the present stage it is apparent that normally short-lived flower seeds like aster and larkspur retain their vitality for a number of years when dried and packaged according to the method determined by the assembled data.

REFERENCES

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A new Epiphyllum (Orchid Cactus) bed constructed in Nov. of native stone by our Horticulturist John Weber. Into this bed were placed 46 Epiphyllums graciously donated by Sherman E. Beahm, Pasadena, Calif., grower and creator of new Epiphyllums. This gift is certainly appreciated and is an added feature to our lath-house.

CALENDAR OF EVENTS FOR DECEMBER

Dec.	1	CACTOMANIACS — Christmas Party	8 P.M.
	2	CLASS — Xerophytes and Mesophytes	3 P.M.
	3	LECTURE — Succulents other than cactus	3 P.M.
	9	CLASS — Desert Survival Plants	3 P.M.
	10	LECTURE — Collecting Plants in Mexico	3 P.M.
	16	CLASS — All-Day Field Trip	9:30 A.M.
	17	LECTURE — Arizona Cactus in Bloom	3 P.M.
	24	LECTURE — Arizona Wildflowers	3 P.M.
	31	LECTURE — Arizona Trees & Shrubs	3 P.M.